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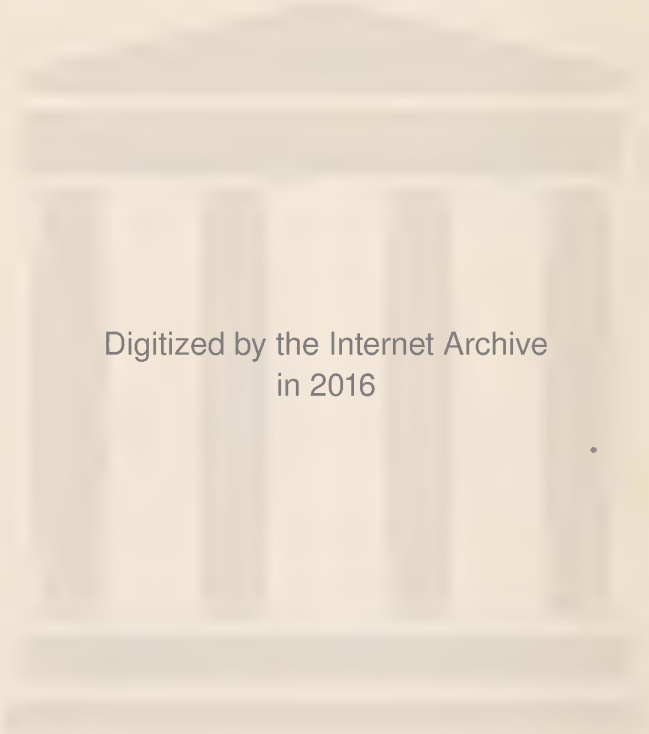
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“It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of Asia will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted; and it will die away if they shall entirely cease.”—SIR WM. JONES.

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JOURNAL

OF THE

ASIATIC SOCIETY.

JULY, 1849.

Notices of some Land and Fresh Water Shells occurring in Afghanistan.—By Capt. THOMAS HUTTON.

The following brief notices refer to the Land and Fresh Water Shells procured during the advance of the Army of the Indus into Afghanistan in 1839. These of course were collected along the line traversed from Dadur in Cutch Gundava, to Girishk on the Helmund,—but it is by no means intended to restrict the Afghan species to the few herein mentioned, for with the exception of the slight attention which my duties occasionally enabled me to pay to the subject, the country was literally unsearched. Some of the species noticed are scarcely determined to my satisfaction, but in the absence of European specimens to compare with them, it was impossible to do more than hazard a conjecture.

Class. 1. Gasteropoda.

Fam HELICIDÆ.

1.—*Parmacellus rutellum*, (Hutton.)

Animal a bright gamboge yellow, with 4 tentacula, posterior portion of the body, behind the shell, carinated; shield strengthened internally with a shovel-shaped shell of a pearly or nacreous appearance; obtuse and globose at the apex, with a deep sinus; covered with a thin transparent epidermis, transversely wrinkled by the lines of growth; colour white; length $\frac{1}{2}$ inch; breadth about $\frac{1}{4}$ inch.

No. XXXI.—NEW SERIES.

4 P

Found at Candahar in April, crawling along the sides of damp ditches in the fields; not rare, though apparently local, and only comes out about sunset. It is a true *Parmacellus* of Rang.

2.—*Vitrina baccata* (Hutton).

This very minute species was found under stones, along the bank of a dry nullah or river bed, at a place called Melmandeh, between the Kojuck Pass and Candahar. It appeared to be very scarce, as after a lengthened search only three specimens were found, and of these unfortunately the animals died before an opportunity occurred for examining them.

Shell small, thin, fragile, diaphanous and pale; whorls apparently only one, or at all events the body whorl may be said to constitute the whole shell; aperture nearly circular, lips scarcely interrupted, slightly thickened and partially reflected; surface of the shell polished, finely striated by minute lines of growth, and ornamented with longitudinal bead-like lines or strings of minute bubbles, which can be seen only under a strong lens. Upper side depressed, flattened; under side rounded, ventricose. Length $1\frac{1}{2}$ lines.

3.—*Helix Candaharica* (Pfr.).

Animal pale straw colour; darkish or dusky on the tentacula; foot not protruding posteriorly beyond the shell, and rather tapering.

Shell much depressed above, orbicular, slightly convex; spire scarcely exerted, whorls 5; colour fuscous or sandy white, ornamented above with a broad longitudinal band of reddish or purplish brown; often breaking into dots where interrupted by the striæ of increase; whorls shining and obliquely striate; aperture ovato-lunate, somewhat oblique; peristome acute, with a thickened rib within the aperture in mature shells; deeply and widely umbilicate, exposing the penultimate whorl and extending nearly to the apex; under side ornamented with narrow dotted or interrupted longitudinal bands of reddish brown, varying much in number from one to six; diameter of largest specimen $\frac{6}{10}$ of an inch; though the generality do not exceed half an inch.

This is a very variable species in regard to colouring, some individuals having the bands well defined, others having them faint and narrow, and some wanting them altogether, in which case the shell is of a faint fuscous white with dark apex.

At first sight it bears a strong resemblance to the European *Helix virgata* (Montagu) vel *variabilis* of authors; the broad bands of the coloured individuals, and the colouring of the unbanded ones, being very similar to that shell. It is however readily distinguishable from it by the more flattened form, and by the greater tendency to exhibit bands on the under side; while the umbilicus, being invariably more open and showing a greater portion of the lower whorls, is of itself a sufficiently distinctive character.

In the fields of Lucerne and Clover, as also in gardens and orchards, this snail is very abundant; it appears to have the habit of clustering together when at rest, in great numbers, a singular trait, which is also observable in the *Helix virgata*. In the end of September, I observed them "*in coitu*," individuals of all colours freely intermixing. The aperture is occasionally closed by a thin viscous plate. Although so extremely common at Candahar, that hundreds might have been collected within a few hours, the species would still appear to be remarkably local, for neither at Quettah on the one hand, nor at Girishk on the other, did I meet with a single specimen.

This shell, discovered by me on the arrival of Shah Shoojah's army at Candahar in the end of April 1839, has been named and described in the Magazine of Natural History, Vol. XVIII. p. 123, by Dr. L. Pfeiffer from specimens in the collection of H. Cuming, Esq. furnished by Mr. Benson, who received them in all probability from myself.

4.—*Helix Bactriana* (Hutton).

Animal straw coloured, with the superior tentacula very long and black; shell carried obliquely horizontal; foot short and rather tapering posteriorly.

Shell fuscous or pale earthy brown, but varying to reddish brown, and in some to sandy; in living specimens dotted over with darker spots or blotches, from the animal being apparent through it; subglobose; spire obtuse, scarcely exerted; whorls 6; aperture ovato-lunate, oblique; whorls obliquely and finely wrinkled with the striæ of growth; peristome acute, pillar lip partially reflected over the umbilicus; a strong white rib within the aperture, showing usually a rufous band externally; umbilicus moderate, exposing a portion of the penultimate whorl. Diameter $\frac{6}{10}$ of an inch. Some have a pale line along the periphery of the body whorl, which is slightly angular.

This is likewise very numerous at Candahar, in gardens and fields, adhering by a thin viscous plate to the stalks of plants; it occurs also abundantly among dead leaves beneath rose bushes, and at the roots of the garden Iris and other plants; sometimes buried in holes in the earth.

It appears to be closely allied to the three British shells, *H. Cantiana* (Montagu), *H. Carthusiana* (Gray), and *H. Rufescens* (Penn), more especially to the latter, which it strongly resembles in colouring, the angularity of the periphery and the blotches of darker colour seen through the shell when the animal is living. In size perhaps it comes nearest the former, as well as in general appearance, but it is less globose in the spire, and the peristome is more reflected.

5.—*Succinea putris*, (Gray.)

There is really nothing to distinguish the Afghan from the European species; the colour, number of whorls, size and shape appear to be quite the same. The animal likewise seems to be in all respects the same. The eyes are situated at the extremity of the superior tentacula, which are cylindrical and buttoned; the second pair diminutive and scarcely apparent; the whole animal is mottled minutely with grey, and several fine grey lines extend backwards from the upper part of the head. It is very common in garden drains, and in marsh lands along the course of the river Helmund at Girishk.

6.—*Succinea Pfeifferi* (Rossm.).

This is apparently another European species, closely allied to, and by some supposed to be only a variety of the foregoing. It has a much shorter spire than the other and the aperture is more elongate.

It occurs plentifully in garden drains at Candahar, but did not appear to mix with the foregoing, and I should be much inclined to regard them as distinct species.

7.—*Pupa lapidaria* (Hutton).

Animal dusky.

Shell composed of 7 cylindrical volutions, exclusive of apex; the three first whorls rapidly decreasing and producing an obtuse spire; the other whorls nearly equal; colour brown; finely wrinkled with oblique striæ of growth; aperture ovato-quadrate; lips subreflected, polished and white within; sub-umbilicate; furnished with eight teeth, two on the pillar within, four on the outer lip within, all of which are

visible on the back of the whorl in four pale bands, giving that part a furrowed appearance ; and two others on the interrupted part of the peristome, the inner one, which is indeed quite within the aperture, being the largest of all, and the other one small and placed at the angle of the outer lip. Length $\frac{1}{4}$ inch.

This pretty little species was discovered under stones among blocks of limestone bordering the desert plain of Dusht-i-be-dowlut, at the western end of the Bolan Pass. It is very closely allied to the English species *Pupa Juniperi* (Gray), having the teeth arranged much in the same manner ; those of the body whorl giving rise externally to the same furrowed or ribbed appearance. It differs however, in having only seven whorls instead of 8 or 9, and in having the largest tooth placed well within the aperture on the middle of the body whorl.

8.—*Pupa spelæa* (Hutton).

Shell composed of eight convex whorls ; $9\frac{1}{2}$ lines in length, of which nearly one half is occupied by the body whorl ; closely and coarsely striated by the lines of increase ; polished, nude, ventricose ; aperture ovato-quadrata ; lips slightly reflected ; subumbilicate ; spire suddenly tapering ; obtuse ; colour white with darker dashes ; the markings however cannot properly be termed *colours*, since they are in reality only streaks in sculpture, caused by the unequal thickness of the shell, which exhibits alternately an opaque and a semitransparent layer of increase. Pillar lip straight ; the outer one bending suddenly in on the body whorl. Found adhering to the inside of fissures and caves at Dusht-i-be-dowlut, and in the Bolan Pass.

9.—*Pupa indica* (Benson's Mss.).

P. cylindrica (Hutton), J. A. S. Vol. III. p. 85, No. 6.

This common Indian species, first described and named by me in 1834, runs into three remarkable varieties, differing so much in size and shape that it would not surprise me to find eventually that they are distinct. The name originally bestowed by me has been abandoned in consequence of its being pre-occupied, and Mr. Benson having proposed, from the wide range of the species, to call it *P. Indica*, that name has been adopted. The large variety has 9 to 10 whorls ; is cylindriciform and tapers suddenly to an obtuse apex ; colour of living shells pale fuscous or earthy, but generally white ; whorls closely wrinkled by coarse waving lines of increase ; in fresh specimens faintly

scored with obsolete longitudinal furrows; shell nude, polished, thick and opaque. Aperture subquadrate, margins thickened and subreflected; varying from $\frac{1}{16}$ to $\frac{1}{8}$ inches in length. Animal dusky; ovo-viviparous. Buries itself in the earth beneath rocks, trees, &c. stopping the aperture with a thin plate of hardened viscous matter.

Var. A.—This is in all respects a perfect miniature of the foregoing, but it seems never to have more than eight whorls, and seldom exceeds $\frac{1}{2}$ an inch in length; it is far less ventricose, and generally shows the obsolete longitudinal furrows more plainly. This variety occurs both in India and near Quettah in Afghanistan.

Var. B.—With the general sculpture of the last, but shorter, seldom exceeding $\frac{7}{16}$ of an inch; whorls ventricose and spire more suddenly obtuse than either of the foregoing; with scarcely more than half the length of *P. Indica*, it still rivals it in breadth, and the longitudinal furrows appear to be constant and better defined. Whorls usually seven in number, rarely eight.

The exuviae of all three may be seen in abundance scattered over the sands of the Bhiawulpore district.

10.—*Pupa caenopicta*, (Hutton,) J. A. S. Vol. III. p. 85, No. 7.

Animal blackish.

Shell cylindrico-pyramidal, with 6 whorls, minutely striate; body whorl ventricose, the others gradually tapering to an obtuse apex; aperture ovato-lunate; lips subreflected and white within; a single tooth at the junction of the outer lip with the body whorl; colour brown. Length $\frac{3}{16}$ inches.

In living specimens the shell is often painted over with a coating of mud, which assimilates it so much to the colour of the rocks it inhabits, as to render it difficult of detection. It was discovered by me in 1832 adhering to the face of a bare rock at Beeana near Agra, and again at Neemuch in 1834, adhering to the bricks of a ruined temple. Mr. Benson has likewise taken it beneath stones at Delhi, but in such situations it is destitute of its coating of mud.

It occurred in Afghanistan beneath stones at Dusht-i-be-dowlut.

In the single tooth at the angle of the mouth, it makes an approach to *Pupa umbilicata*, (Gray) of England, but it differs altogether in shape; in being larger, less abruptly obtuse and more tapering.

Fresh Water Shells.

Fam. PALUDINIDÆ.

11.—*Paludina parvula*, (Hutton.)

Animal dusky grey.

Shell conoid, of four whorls exclusive of apex; colour of epidermis dull or dusky green; aperture ovate, rounded below, angular above; oblique; operculum horny; subumbilicate, pillar lip partially reflected; sutures deep; epidermis of the upper whorls usually eroded; transversely striated by fine lines of growth. Length $\frac{3}{16}$ of an inch, or less.

Inhabits a marshy patch of ground caused by a spring oozing from the side of the Kojuck Pass, at Chummun.

Fam. LIMNÆADÆ.

12.—*Limnæa peregra*, (Lam.)

This so closely resembles one of the varieties of the European shell, that I can see no good reason for separating it. On comparing it with an English specimen long since presented to me by Mr. Benson, no character appears to authorize the idea of its being other than a mere variety, and the differences, where any exist, are nothing more than the variations usually observable in a series of specimens. In fact the only difference that I can see, consists in the spire of the Candahar shell being rather more exerted than in the European specimen before me,—but in this respect, judging from Gray's figures and description, there is always great variety, and consequently no importance can be attached to it. At Candahar the species was very common in brick tanks, and almost invariably covered with small aquatic plants or incrustations of lime, concealing the colour, and sometimes even the shape of the shell, a fact which is likewise observable in regard to the European species.

Var. A.—Low down on the Western side of the Kojuck range of hills, at some distance below the Pass, is a green spot called Chummun, from whence issues a small clear spring of water, which spreading over the slope, forms a marshy patch in which are several species of shells, and among them occurs another variety of *Limnæa peregra*, which living in running water is free from the impurities which attach to the Candahar variety, and the substance of the shell is perhaps somewhat thicker.

13.—*Limnæa truncatula* (Gray).*L. fossarius* (Turton).*L. minuta* (Lam).

Animal grey. This is another European species very common on the marsh lands bordering the river Helmund at Girishk, as well as in similar situations at the Kojuck Pass and at Quettah.

In Gray's edition of Turton's British shells, the European shell is stated to be "half an inch long" and to have "six or seven rounded and deeply divided volutions,"—whereas the largest of the Afghan shells does not exceed $3\frac{1}{2}$ lines, and the whorls are only five in number exclusive of apex. These differences which at first sight might be supposed to indicate distinct species, are however counterbalanced by the fact that the shells of *Limnæa truncatula* are said to be "extremely variable in size and colour, according to the locality in which they are found, and the abundance of their food," and "Mr. Alder observes, that a variety of a much smaller size is found on the margins of rivers, another is found in mountain streams."—(Gray's Turton's British shells).

These latter remarks are strictly applicable to the Afghan shell and leave no doubt as to its being one of the varieties of the European species.

Mr. Benson likewise informed me that he had taken still smaller specimens than mine, in Ireland.

14.—*Limnæa Bactriana* (Hutton).

Animal mottled black and grey.

Shell small, brittle, $\frac{9}{16}$ of an inch long; spire loosely and obliquely twisted; sutures deep, whorls rounded, aperture ovate long; pillar lip partially reflected; shell closely striate transversely; aperture occupying $\frac{2}{3}$ of the shell; colour pale greenish brown; whorls 4.

This shell has very much the appearance of the young of *Limnæa chlamys* (Benson), of the gangetic provinces, but the whorls are more rounded, and the spire more horizontally twisted and less awl-shaped. The size however would alone distinguish it, as the largest do not exceed $\frac{9}{16}$ of an inch, whereas my Scindh specimens of *L. chlamys* are 2 inches. The general size of Indian specimens is about $1\frac{1}{2}$ inches.

It occurred in marsh lands and streams at Quettah, in Afghanistan.

15.—*Planorbis convexiusculus*, (Hutton.)

Animal black or dusky.

Shell depressed, $\frac{1}{4}$ of an inch in diameter; pale horn colour; polished; closely and obliquely striate; whorls 4 or 5; rounded; suture well defined; periphery subangular, but not influencing the aperture, which is ovato-lunate; umbilicus wide, discovering all the previous volutions; the whorls rising gradually and spirally from the horizontal, and rounded below.

Occurs plentifully at Candahar in tanks; at Quettah and the Kojuck Pass in marshes, and along the marsh lands of the river Helmund at Girishk.

I have lately ascertained that it likewise occurs in the Gangetic provinces, having taken it from a tank at the foot of a range of hills bordering the grand trunk road, at Tope Chancey. I likewise procured it some years ago from mountain streams at Pinjore below Simla, without then observing the difference, as I find it in my store boxes mixed up with *P. compressus*. It differs from that species in wanting the delicate carina on the peryphery, and in having a lunate aperture without the angle on the middle of the outer lip; in being more convex, with rounder whorls: and in having its volutions wound round on a more open and less horizontal twist.*

Fam. MELANIADÆ.

16.—*Melania elegans*, (Benson.) Gleanings in Science, No. 13 for 1830, p. 22, species C.

This very beautiful species was found in the Bolan Pass at Beebee Nanee, where in April the pebbly bottom of the stream was perfectly alive with them; yet on my return to India two years afterwards in February, not a single shell was visible, all having burrowed deep into the sand in order to escape from the chilling wintry temperature of the mountains.

The largest specimens procured were $1\frac{2}{16}$ ins. in length, by $\frac{7}{16}$ ins. wide; shell turreted, gradually tapering to an acute apex; each whorl armed with a row of longitudinally raised ribs, tuberculated at the upper part; epidermis thin, variously coloured, being sometimes fuscous

* Had I not sent specimens of this shell to Mr. Benson, who pronounced it new, I should from his description have considered it *P. umbilicalis* (Benson) from Sylhet.

white, flavescent green, or pale olive green, all being ornamented with purplish or reddish brown flame shaped transverse bands, interrupted and broken into dots by numerous longitudinal furrows, crossed and wrinkled by the lines of growth; in many specimens the whorls bordering the sutures, and the summits of the tubercles are white, which adds greatly to the beauty of the shell; aperture oblique, subovate, longer than broad; operculum horny, and deep brown.

This shell is an inhabitant also of our Indian rivers, and was discovered by Mr. Benson, several years ago. As it was not found beyond Beebe Nanee in the Bolan Pass, it can scarcely be called an Afghan species, though it may serve perhaps to point out the western limits of its geographical range.

17.—*Melania pyramis*, (Benson.) Gleanings in Science, No. 13 for 1830, p. 22, species B.

This common Indian species occurs plentifully at Dadur in Cutch Gundava, and attains a size and beauty equal to any specimens from the Gangetic Provinces. Leaving Dadur and entering the Bolan Pass we again find it mixed up with the foregoing species at Bebee Nanee, but generally of smaller size and less beautiful in the markings. Proceeding onwards we meet with it at Quettah in a clear stream, though of still smaller size than before; this last is that variety of the Indian shell which has a well defined longitudinal reddish brown band along the outside of the columellar or pillar lip. In a marshy and semi-stagnant piece of water at Quettah there is also another variety, large and coarse in sculpture, without markings, and the apex of the spire and epidermis eroded.

As Beebe Nanee appears to be the limit to the range of *M. elegans*, so Quettah would appear to be the limit of *M. pyramis*, as I found no trace of it in the streams farther to the westward.

18.—*Melania tigrina*, (Hutton.)

Shell devoid of apex, the spire being invariably much eroded; general appearance that of *M. pyramis*, but differs in being coarser, in wanting the strong and prominent longitudinal furrows which characterise that species, and which are observable throughout its length; the outer lip also has a tendency to be more produced; while the flame-shaped streaks of colouring are narrower, closer, and less devious or zigzag, often becoming bifid or pronged on the body whorl; epidermis

pale olive green or olive brown, ornamented with close, narrow irregular transverse dashes. General number of whorls in eroded and decollated specimens, five; though nine or ten would appear to be the correct number; wrinkled transversely by coarse lines of increase; the upper angle of the aperture is never so acute as in *M. pyramis*, and the sutures are deeper and whorls more tumid at their junction.

Mr. Benson thought this a mere variety of the preceding shell, the differences being induced by a residence in stagnant waters; this however can scarcely be the case, since in the very same waters, *M. pyramis*, likewise existed, with a full spire and all its other characteristics; even in the uncoloured variety of that species which has the apex partially eroded, the longitudinal furrows and general sculpture of the shell still exist to point out its distinctness.

This species is not peculiar to Afghanistan, having been first discovered by me in 1836 in a garden tank at Pinjore below Simla. Pinjore shells of 5 eroded whorls, measure $1\frac{5}{8}$ ins. in length, and are finer than Afghan specimens, which do not exceed $1\frac{3}{8}$ ins., while fully formed individuals of *M. pyramis* from Dadur and the Gangetic Provinces, having 12 whorls, measure no more than $1\frac{1}{2}$ in. This alone would appear to settle the question of distinctness.

Class 2. *Conchifera*. Lam.

Fam. CYCLADÆ.

19.—*Pisidium paludosum*, (Hutton.)

Shell minute; $\frac{1}{8}$ of an inch in breadth; $\frac{1}{10}$ in height; oval; umbones rather blunt; very finely striate transversely; shining dark olive or dusky green.

Inside whitish.

A single specimen only was taken in the swampy ground at Chummun, on the Kojuck range in Afghanistan.

20.—*Corbicula* ———?

I refrain from naming this species, which though much larger, appears identical with one of our Indian shells, because I know that Mr. Benson long since showed specimens to Mr. Gray, and it is therefore more than probable that it has been named already, although unknown to me. It is common in canals at Candahar, and attains a size exceeding any I have seen in the Gangetic Provinces, measuring in my finest specimen $1\frac{3}{16}$ of an inch in breadth, and one inch in height; the

generality however, measure less, being $1\frac{1}{16}$ in. wide and $\frac{1}{16}$ in. in height. It is strongly furrowed transversely; with olive brown epidermis and beaks denuded.

Var. A. Also found in the Gangetic Provinces; smaller than the last, being in breadth $\frac{7}{8}$ in. by $\frac{1}{16}$ in. high, transversely furrowed; epidermis yellow, or sometimes greenish, half way from the beaks, with a broad yellow border; inside violet or purple, as in the last, of which this may be the young.

Fam. UNIONIDÆ.

21.—*Unio marginalis*, (Lam.)

Shell oval oblong, ventricose, tumid; not produced nor attenuated behind; beaks flattened and denuded; upper edge rounded or falling; lower edge curved; strongly wrinkled transversely; epidermis olive brown; in young specimens with broad yellowish margin. Largest specimen measuring $1\frac{1}{8}$ in. long, by $2\frac{1}{16}$ in. broad; another $1\frac{1}{8}$ in. by $2\frac{1}{16}$ in.; and a third measures $1\frac{3}{8}$ in. long, by $3\frac{1}{16}$ in. wide.

Occurs at Candahar in canals.

Mr. Benson thought this only a strong variety of *U. marginalis* of Lamarck, and in deference to his opinion I have so named it; at the same time I am much inclined to think it distinct, and propose, should it prove so, to call it *U. Candaharicus*. The differences observable appear to consist in the less produced and lengthened form posteriorly,—in the upper part of the anterior edge being straighter and more elevated, than in *U. marginalis*,—and in the beaks being less denuded and more wrinkled.

In *Unio marginalis* of the Gangetic provinces, the breadth appears to exceed the length much more considerably than in the Candahar shells, measuring in four specimens of each as follows:—

1. *Indian specimen*. Length $1\frac{6}{16}$ in.; breadth $3\frac{2}{16}$ in.
2. Ditto ditto length $1\frac{1}{8}$ in.; breadth $3\frac{1}{2}$ in.
3. Ditto ditto length $1\frac{6}{16}$ in.; breadth $3\frac{2}{16}$ in.
4. Ditto ditto length $1\frac{1}{2}$ in.; breadth 3 in.
1. *Afghan specimen*. Length $\frac{1}{8}$ in.; breadth $2\frac{5}{16}$ in.
2. Ditto ditto length $1\frac{1}{8}$ in.; breadth $2\frac{1}{16}$ in.
3. Ditto ditto length $1\frac{1}{8}$ in.; breadth $2\frac{1}{16}$ in.
4. Ditto ditto length $1\frac{3}{8}$ in.; breadth $3\frac{1}{16}$ in.

The proportions thus appear to be reversed,—the Indian species show-

ing a greater transverse breadth in proportion to its length ; the Afghan one showing a greater length in proportion to its breadth. All my specimens of the Indian variety are produced or elongated posteriorly, giving the shell a narrow wedge-shaped appearance ; whereas the Afghan one being transversely shorter appears ovate oblong.

Diary of a Trip to Pind Dadud Khan and the Salt Range.—By ANDREW FLEMING, M. D. Assist. Surgeon 7th N. I. on Deputation to Pind Dadud Khan. (Communicated by Sir H. M. ELLIOT, Sec. Govt. of India.)

March 9th, 1848.—Lahore to Pind de das ka kote, 10 kos.—Left Lahore this morning, crossed the Ravee and arrived at Pind de das ka kote by 8 A. M., said to be 10 kos from Lahore. A level uninteresting country intervening, in great part uncultivated, except in the proximity of the few wells which are dug, and where crops of a fair appearance are raised. A saline efflorescence of sulphate of soda occurs in great quantity along the whole way, but does not seem to have any injurious effect on the soil, irrigation being apparently all that is required to render it productive of good crops. Four miles from Shah Dera there is a pukka bridge named Pere ka Pool, which spans a nullah, and which is going fast to ruin, but might be repaired at a trifling expense, and would in the rains prove a great comfort to travellers. Within $\frac{1}{2}$ a mile of Pind de das ka kote is a fine pukka bridge across a nullah called Bagh Binha, down which at present a considerable stream of water is running, and from which a supply of water to irrigate the neighbouring country might be obtained, were means for raising it available. Some zemindars came to complain that Pertaub Sing and followers had been here 4 days before and cut green corn for their horses to the value of Rs. 8, without giving the proprietors any remuneration. Directed injured parties to proceed to Lahore to obtain redress. Supplies obtained in abundance, and water good within 5 or 6 feet of surface.

March 10th.—From Pind de dass ka kote to Santipore, 10 kos.—From Pind de das ka kote marched to Santipore, a distance said to be 9 kos, but certainly more. Road level, the intervening country being much of the same character as in preceding march, and wells even

scarce, but where these exist good crops are raised around them. Passed Wudala and Shechem, two considerable sized villages, around which good rich crops of wheat and barley were growing. Around Santipore there is a good deal of kunkur in the soil, which at a little distance from the village is covered with a low dwarf jungle of Caper bushes. Supplies in abundance, water good, though 15 or 20 feet from surface.

March 11th.—Santipore to Muttoo, 9 kos.—From Santipore to Muttoo, a distance of 9 kos, the road leads through a level country covered with low bush jungle, in the centre of which however occasional fields of wheat and barley are to be seen, where enterprising individuals have dug wells and cleared away the jungle from their neighbourhood. On the way here passed the villages of Retalee, Vernala and Khan Musselman. Water good though about 23 or 30 feet from surface, and raised by Persian wheels, which seem universal in this part of the country.

March 12th.—Muttoo to Oodeewalla, 10 kos.—Marched from Muttoo to Oodeewalla, a distance of 10 kos. General appearance of the country improved, crops being richer, and the fields studded with Babool trees of considerable size. Patches of sugarcane and remains of cotton plantations observed round the villages,—Lulla and Thabul being the only ones of any size near the road. Kunkur exists in considerable quantity around this village, where the water is good about 20 feet from surface, and supplies abundant.

March 13th.—Oodeewalla to Ramnuggur, 10 or 12 kos.—From Oodeewalla to Ramnuggur the distance is said to be 10 kos, but is certainly much more. The intervening country, where cultivation does not exist, is covered with a short coarse grass and is quite level. Noewalla and Akalgurh are the only two villages of any size that occur in this march. The latter is a place of some size, several fine gardens existing in its neighbourhood, where the crops are rich and fields well dressed. Kunkur occurs in great quantity around Akalgurh, where the road was completely under water in consequence of recent rain. Three miles beyond this, is Ramnuggur, a town of considerable size. Put up in the Bara-derry, around which some Sikh Artillery are stationed under the command of Col. Lookha Sing, who paid me a visit. There is a salt depôt close to the Bara-derry, where at present 10,000 maunds of salt are accumulated. It is brought on camels from the salt mines, the owners of which receive 4 annas per maund that is deli-

vered at the depôt. It is all weighed previously to being stored up, and is retailed to merchants at Rs. 2-4 per maund. The thanadar and Kardar of this place accompanied me through the depôt and paid me every attention. The Chenab is distant about 2 miles from this place—a flat and in great part uncultivated country intervening.

March 14th.—Ramnuggur to Phalia, 12 kos.—From Ramnuggur crossed the Chenab, which is easily effected, the boats being large and in good order, and marched to Phalia, said to be 10 kos, but is certainly more. The Chenab seems to have a considerable depth of water in its channel, but is evidently swollen at present in consequence of recent rains in the hills. On the north bank of the river, and from thence to Phalia, the country is richly cultivated and interspersed with numerous babool and bur trees, which attain a considerable size. On the side of the road are situated the villages of Remmuhl, Pagut, Truka and Kumina. Phalia is a small place, but has a mud fort in its interior. Around it there is a deal of bush jungle, where kunkur occurs in great quantity. At night heavy rain fell and continued falling until 5 A. M.

March 15th.—Phalia to Phukie, 7 kos.—Had directed my servants to go on to Hurrin, but in consequence of the rain, they could not proceed farther than Phukie, a march of about 7 kos. The road leads through a thick bush jungle, and so is very heavy in consequence of the rain during the night. Phukie is but a small place—supplies obtained in abundance, but water very bad and brackish, evidently containing a quantity of saline matter. Cultivation to a very small extent exists around this village. Ruttivall is a village of considerable size on the road to this place.

March 16th.—Phukie to Hurrin, 6 kos.—In consequence of rain which fell incessantly from midnight till 8 A. M. was unable to march further than Hurrin, where I found my tent pitched, my servants being unable to get on to Mianee as I had intended. The whole country was under water and the crops completely levelled to the ground in many places. A very dense jungle intervenes between Phukie and Hurrin, where the country is more open and well cultivated, being situated about a mile from the Jhelum, along the banks of which a dense jungle of Tamarisk occurs. The river Jhelum is much flooded and appears a noble river running at the foot of the salt range, which is only about 4 miles from it, a rich wooded Kadir land apparently intervening. Sup-

plies abundant. Complaints made by the sepoy's of my Seikh guard that the bunneals here were using *a seer 6 pice less in weight* than the Company's seer, which is very much lighter than the Lahore one, and which we should suppose is the seer used through the country under the Lahore Government.

March 17th.—Hurrin.—Halted here to-day as my tents were still very wet and too heavy for the camels. Jhelum considerably swollen since yesterday and the fields in its neighbourhood perfect swamps. Several very fine poppy fields are growing near this, which are said to yield good opium. Supplies in abundance and water remarkably good.

March 18th.—Hurrin to Meanee, 7 kos.—Hurrin to Meanee said to be 7 kos. Towards the Jhelum the country is well cultivated, but to the south of the road until close to Meanee, dense bush jungle covers the country. Several villages occur, the principal of which are Badshapoor, Kirtowall, Chuckdunda, Mulick, Wall, Bula, Chuckseydeda and Kalianpore. On arrival here was waited on by the Kardars, Mulk Doulat Rai and Dass Mull. Around this village poppy fields are pretty numerous and a good deal of opium is said to be made here.

March 19th.—Meanee to Pind Dadud Khan, cross Jhelum 3 miles. Crossed the Jhelum this morning and reached Pind Dadud Khan, which is only 3 miles distance from Meanee. The boats on the Jhelum are remarkably large and good, and are propelled across the stream by a large oar, the first we have seen on the Punjaub river boats. The passage of the Jhelum is a very tedious one, from its breadth and the strength of the current. Above Pind Dadud Khan it is divided into two branches that unite into one main stream a little below the towns which is about a mile distant from the river, and situated on a plain of about 4 miles in breadth between the river, and the foot of the salt range, and richly cultivated. Dispatched weekly diary to Lahore and received a visit from Missers Rulla Ram and Gyan Chund, who offered a nuzzur of Rs. 110, which was accepted. The latter shewed me specimens of coal from Keurah, also lumps of iron pyrites from the same place, and specimens of crystallized and compact sulphur from the neighbourhood of Mokudd.

March 20th.—Pind Dadud Khan.—Accompanied by Jowhair Mukl, one of the Missers Munshies, I started at daybreak to visit the district where the salt mines of *Keurah* occur, and where a coal was said to

exist. Distance from Pind Dadud Khan to foot of the hills is about 3 miles, where the road becomes very bad, being covered with loose rounded boulders which have rolled down from the heights above. From the foot of the hills to the salt mine village of Keurah is about 2 miles, through a valley surrounded on each side by rocks of red brick-coloured marl, full of white masses of saccharine gypsum, and resting on a conglomerate of red sandstone. This red marl appears to be the matrix of the rock salt which is found in greatest abundance at *Keurah*, where there are no less than 10 shafts sunk into the marl for the purpose of extracting the article, which is deposited in large quantity around the village as it is brought out of the mine by the workers. The principal shaft at present worked is to the right of the village, the entrance to which is by an opening about 7 feet high cut in the red marl, and leading into a passage which sometimes ascending, at others descending, at last reaches a chamber 30 feet in height, 40 feet long and 640 feet from the mouth of the shaft, and excavated entirely from the rock salt, of which there yet seems abundance, above and below and on either side. In this chamber men, women and children are engaged working the salt by the light of small lamps hung on the walls of the mineral, and their appearance in the dim light is highly striking—their faces and bodies being covered with a saline incrustation. In the bottom of the chamber is a hole filled with brine, said to be of great depth, and to communicate with the other shafts in the neighbourhood. The salt occurs in three varieties—the red, white and glassy, but the former is preferred for culinary purposes, as containing, it is said, less *reshuh*—a term which we presume means “*impurities*.” Although the salt occurs in greatest abundance in the chamber, it is seen all along the passage leading to it, until within 100 feet of the surface, when it becomes mixed with shining masses of crystallized gypsum imbedded in the red marl and which occurs in great quantity in the salt range, both compact and crystalline. In the mine great annoyance is experienced at times by the falling in of the roof and sides of the workings, which might in a great degree be prevented and many lives saved, if proper means were taken to support the roof and sides of the rock from which the salt is extracted, very insufficient means being at present employed, and hence the frequency of accidents. Salt is only extracted from the mines for 8 or 9 months in the year, the danger of working during the rains from

the falling in of the roof of the mines, preventing all operations from being carried on. In the salt mine village of Keurah, there are about 650 inhabitants, 400 of whom are employed in the mines, from which are extracted, according to Misser Gyan Chund, from 48, to 50,000 maunds of salt per annum, at an expense of from Rs. 2, 2-4 to 2-8 per 100 maunds, according to the quality of the salt excavated, and which is sold at Rs. 2 per maund at the mouth of the pit.

Above the red marl containing the salt is a saulpion of conglomerate, sandstone and limestone strata, presenting a steep escarpment to the south and dipping gradually to the N. or N. W. at angles which vary at different points examined. The coal of Keurah is situated about a mile from the salt mine, and to the N. E. and is imbedded in a series of thin laminated sandstones and bituminous shales, charged with aluminous earth and pyrites. The seam is about 2 ft. to $2\frac{1}{2}$ ft. thick, and rests on a blue clay, into which I dug 6 ft. without getting through it. The coal dips to the N. W. with the other strata, and may be traced across a valley for about 30 yards, where it appears to thin out among the blue clay on which it rests. Large samples were obtained of this coal and brought to Pind Dadud Khan. It burns readily to a brown ash, and gives out a powerful heat, but we fear its position in the midst of the hills, which is difficult of access, would render the working of it, *supposing* it to exist in a *regular seam*, a most expensive business. In a limestone in connection with the coal, I detected numerous fragments of fossil shells, a fact of great interest, and which we trust will give a clue to the geological formation in which the coal beds occur, and which we are inclined to consider comparatively recent. The fossils are found at a height certainly not less than 15, or 1600 feet above the level of the sea, 2,100 feet being I think generally given as the height of the salt range. Got back at sunset to my tents at Pind Dadud Khan.

March 21st.—Visited again the seam of coal and hills in the neighbourhood of Keurah, but could find no traces of more coal, the seam apparently dipping under the strata forming the range to the N. The coal seems evidently to occur in strata superior to the salt, and hence will probably turn out to be one of those lignites, or irregular deposits, of coal, which in circumstances favorable to their working, have been excavated from time to time at Brora in Sutherlandshire in Scotland, Boney Tracy in

England, and on various parts of the continent, especially along the Rhine. I had the fortune to-day to discover about a dozen species of fossil shells and several other fossils of great interest, of all which and of the strata of the range a collection has been made. In the shales containing the coal a quantity of a luminous earth and iron pyrites exists, from which the alum of commerce could be obtained. Crystals of sulphate of magnesia were found in connection with the alum shales and specimens preserved. Returned to Pind Dadud Khan at sunset.

March 22nd.—Pind Dadud Khan.—Received visits from Missers Rula Ram and Gyan Chand, who have yielded me every assistance in their power in the prosecution of my investigation of the range of hills. Visited the mint here, which is under the superintendence of the former. Silver is collected in all directions in the shape of old rupees, bangles and silver ornaments, which after being refined are converted into the new Lahore Rupee. At present the silver from which rupees are being manufactured, are Mahmoud Shah Rupees from the Hazara and countries to the north, and of the value of about 12 annas. These contain copper and lead, which is separated from them previous to their being converted into the new rupees. This is effected by the process of cupellation, and which is performed in a very simple but effective way. A hole is dug in the earth according to the size of the cupel to be made, into this hole a quantity of wood ashes is thrown, moistened with water and wrought up into a saucer-shaped vessel, its sides projecting above the level of the ground. On these are placed two pieces of fire clay so as to increase the depth of the cupel and encircle its mouth, except for about 3 inches at one side, in which is inserted the mouth of a tube connected with a mussuck to act as a bellows. This apparatus being prepared, the cupel is filled with charcoal, on which after it is ignited the silver to be refined is thrown, and in the case of the Mahmoud Shah Rupees, an equal weight of lead is thrown in along with them so as during its oxidation to carry all the copper into the substance of the cupel, and leave the pure silver behind. The experiment we saw performed was on Rs. 1000, and the operation was finished in two hours, during which time an intense heat was kept up by the bellows. The lead and copper are afterwards extracted from the cupel by ordinary means, and contain a little silver, probably in conse-

quence of the quantity of lead used being in excess of the proper proportion to the amount of copper contained in the assay.

The silver being obtained of sufficient purity to constitute the new rupees, which are *said to be pure silver*, it is cut into bars about the breadth of a rupee and handed over to an artificer, who cuts these into the necessary weights to constitute the rupees. This being done, the rough bits of silver are heated to redness on hot charcoal, and when hot are beaten on an anvil with a round-headed hammer into the shape and size of the standard rupee. In this state they are handed over to a man who finishes them by impressing the necessary inscription, which is done on a *die* of a most simple description, being an anvil with a round and highly tempered steel surface, on which the inscription is engraved in reverse. On this the rupee is placed, and on it a punch with a round and highly tempered steel face, on which the inscription to be impressed on the upper side of the rupee is carved. The punch being applied to the rupee, a smart blow from a heavy hammer is given by a man who stands in front of the one in charge of the die, and who holds the punch in his left hand and a handful of *raw* rupees in his right, the lower die being firmly fixed in a strong case. In this way 40 rupees were passed through the die well engraved, in one minute, and the artificer said that on an average he could engrave 1500 per hour. From 1000 Mahmoud Shah rupees, 750 new Lahore rupees are manufactured.

March 23rd.—Pind Dadud Khan.—Left Pind Dadud Khan at sunrise for the purpose of visiting a point of the salt range to the W. of Keurah, and to the N. W. of the former town, where the range seemed to attain a great height, the fort of Dundhote being built on it. The ascent being very difficult and rocky, was obliged to leave my horse behind and go on foot to climb the hills. As before, the lower part of the range at this point is formed of the saliferous red marl, but at present is not excavated for salt. Above this is a succession of sandstones and conglomerates, almost destitute of vegetation on their surface and dipping to the N. W. at a considerable angle. Superimposed upon these and a considerable distance below the fort of Dundhote, there occurs a series of fossil sandstones and bituminous shales, among which a seam of coal 2 *ft. thick* is found, in every character appearing the same as the one described as occurring at Keurah, 2 or 3 miles distant. It

does not however appear of so good a quality, but from its position in the heart of the hills, where no beast of burden could at present reach it, can never be worked to advantage. In relation to it I met with the same limestone as at Keurah, and obtained several fossils in addition to those I got at the latter place, among which was an *Echinus*, and a species of coral, besides several species of shells. Above the coal shales is a succession of calcareous sandstones, generally of light red color, and resting on these is a bold escarpment of a limestone rock, apparently siliceous and containing large numbers of flints such as are found in the English chalk formation. From the strata below this the water that issues is perfect brine, while from the limestone the water flows sweet and good, and is most refreshing to any one who attempts to climb such hills. I reached the top of the range at the fort of Dundhote about 3 P. M., and was quite taken by surprise by finding on the gentle northern slope of the limestone strata, which we are inclined to identify with the chalk formation, a beautiful garden in the midst of a comparative desert—crops of wheat, barley, &c. being in full growth on the soil formed by the decomposition of the limestone. This fort seems to be placed on one of the highest points of the range, and commands a most extensive view. It is said to be within 4 miles of *Kutas*, and from it *Choe*, a fortress in the hills, is well seen. After resting a little, began the descent of the hills, which from the rough road was almost as difficult as the ascent, and reached my tents at Pind Dadud Khan about dark, pretty well knocked up with my day's work, which however well repaid me for the labour of the ascent.

March 24th.—Pind Dadud Khan.—Received visits from Missers Gyan Chund and Rulla Ram, and dispatched diary to Lahore. Again visited the Mint to witness the process employed for the revival of the lead, copper and small portion of silver absorbed by the cupel alluded to in diary of 22nd, but which presented nothing uncommon; a mixture of *Sujee* (Carbonate of Soda), and Borax being used to reduce the oxidized metals to a metallic state. *Sujee*, a coarse Carbonate of Soda, is manufactured near this in quantity by burning a Chenopodeaceous plant, probably allied to *Salsola*, from the ashes of which it is obtained. This occurs in great quantity wherever the soil is impregnated with salt, as is the case in the plains at the foot of the salt range.

March 25th.—Pind Dadud Khan, to Ruttipind.—Visited the vil-

lage of Tober, where during the rains, on account of the heat and mosquitoes, the inhabitants of the salt mine village of Keurah are obliged to take refuge, completely deserting the latter. It is situated at a considerable height above the salt mine to the west of the road to Kuttass, and is built on the sandstone strata which rest on the saliferous red marl. The access to it is by a narrow footpath cut out of the rocks, the ascent of which is very steep. The huts of the village are all built of stone, cemented with mud and are flat-roofed. Beyond this village are a succession of heights rising one above the other of sandstones and conglomerates, the former at times highly calcareous and dipping to the N. at an angle of 35° or 40° . Ascending towards the white cliffs above the village of Ruttipind or Goomrali, one comes on a series of friable white and yellow calcareous sandstones of a coarse kind, succeeded by a series of dark-coloured bituminous shales full of gypsum and pyrites and interlaminated with thin beds of a yellow clay. These shales are from 30 to 35 feet thick, and inclosed in them I discovered two seams of coal, the lower 2 ft. thick and separated from the upper, which is 4 ft. thick by about a foot of shales. Both seams were traced down a valley for 50 or 60 yards, but the coal does not appear so good as that of Keurah, being more brittle and containing a good deal of clay. Above the shales is a yellow marl containing a few shells; and superimposed on this the same limestone containing abundance of fossils as found at Keurah, Dundhote, &c. Covering this is the white siliceous limestone full of flints. It contains fossils, and forms the summit of the hills of the range. On reaching the top of these a series of valleys running east and west is presented to view, yielding good crops and abundance of sweet water, and forming a striking contrast to the southern aspect of the salt range. Close to the village of Ruttipind there is a large *kutch*a tank of water. In the afternoon got back to Keurah and visited another salt mine about $\frac{1}{4}$ mile distant, called *Lugoowalla*. This mine yields a very large quantity of salt of the best quality, and is very easily worked. The entrance to it is at a considerable height on the side of a hill, and the descent into the mine is by a series of steps. The salt is close to the surface, and in the interior of the mine enormous masses of salt are lying which have become detached from its roof and sides, and under which the various passages lead to an immense distance. The temperature of this mine was much lower than the Keurah one,

but having through an accident broken my thermometer was unable to ascertain it exactly. There is a good deal of moisture in the mine, and probably to this cause may be assigned its comparative coolness. The salt appears quite inexhaustible, and to be deposited in strata with their partings of red marl, and dipping to the N. at an angle of 35° or 40° . The roof of the mine is here and there rent and cracked in an extraordinary way, and is incrustated with a salt efflorescence as well as with stalactites of salt, which with the dim light in which they are seen, present a most striking appearance. Some of these were upwards of a foot in length and much resembled the stalactites of carbonate of lime so often seen under bridges or in caves. Goolab Sing is the last individual who has visited this mine from curiosity, which is considered rather unsafe from the loose state of the rocks forming its roof and sides. It is however by far the most wonderful of the mines in the neighbourhood. Got back to Pind Dadud Khan late in the evening.

March 27th.—*Pind Dadud Khan to Baghanwalla, 10 kos.*—Left Pind Dadud Khan this morning and marched to Baghanwalla, a distance of fully 10 kos, to the east of the former town, the road leading through a well cultivated plain running parallel to the salt range. Within about 2 miles of Baghanwalla the road becomes very stony and bad, and the soil in its neighbourhood studded with bushes of *Salvadora*, *Capparis*, *Aphylla*, *Asclepias gigantia*, *Zizyphus*, &c. &c. which reach up to the very foot of the range. When these have been removed good crops of barley are raised, water being abundant for the purpose of irrigation. The village is situated at the foot of a valley, and is built on the sandstone forming the base of the hills. No salt is got here, although the ground is in many places incrustated with a salt efflorescence, and the red gypsum marl prevails, but not nearly to the extent that it does to the east. The comparative absence of salt in the rocks around the place is evinced by the much greater amount of vegetation prevailing on their surface, which in many places is covered with trees of small size, so as to give a green appearance. In the afternoon visited some of the heights to the east of the village, but saw no traces of coal or other minerals of importance. The red saliferous marl is succeeded by a series of bluish grey soft argillaceous fissile sandstones dipping to the N. N. W. at a considerable angle, and on which rests a blue calcareous sandstone. Above this is a fawn colored siliceous fine grained lime-

stone of considerable thickness, on which rests a series of variegated sandstones enclosing nodules of a greenish clay. The prevailing color of these strata is blood red, and on their northern slopes, which form a succession of valleys, vegetation seems to thrive. We here found a species of *Nerium* growing on the banks of the rivulets, a *Scrophularia*, a *Viola*? and several other interesting plants. In the clear stream which runs through the village of Baghanwalla, there are numerous small fish of a species of *Salmon*? *Cyprinus* and *Cobitis*? none of them however longer than 6 inches; a species of crab is also frequently to be seen in the fresh water streams of the range, and even close to its summit.

28th March.—Baghanwalla.—Visited the coal seam which occurs in a small valley about 3 miles N. E. from this, in the middle of the hills, which from the neighbourhood of Baghanwalla to the point where the coal is seen, are of a blood red color, from the sandstone rocks on their surface. The coal, as in the other localities where the mineral is found in this neighbourhood, is associated with a marl, bituminous shales and limestones full of fossils, and in this locality these occur in the succession mentioned, resting on the variegated sandstones constituting the middle part of the hills. The coal seam is included in a yellow calcareous marl and is in some places 5 ft. in thickness. Above the marl, and within a foot of the coal, the limestone is full of shells, indeed it appears to be composed of them; and on it is a stratum of chalk limestone, which seems the representative of the siliceous flinty limestone which in other points of the range is so largely developed. The coal seam can be traced on each side of the valley where it is best seen, for at least $\frac{1}{2}$ a mile, in some places appearing to degenerate into highly bituminous shales, and in others to form really good coal, the best and thickest part of the seam being in the valley above mentioned. The seam dips conformably with the strata above and below to the N. N. W. at an angle of 45° to 50° , and from its general appearance and the geological character of the rocks and fossils with which it is associated, appears to us to be, if not the same, at least one much resembling the seams at Keurah, Dundhote and Ruttipind, and differing from these apparently in their being a less development of bituminous shales, their place being supplied by the lignite seam, which in some places includes brown masses of half decomposed vegetable matter. Above the carboniferous

strata is imposed a grey friable sandstone, which is succeeded by a series of strata forming a range of low hills running N. N. E. towards Doo-meyala, and between the village of Futtipoor and mount Tillah. These strata appear to be a succession of soft sandstones of a red and blue color, and appear to dip towards mount Tillah, which is about 20 miles distant. In the coal large masses of sienite or crystallized gypsum are found imbedded, and in the shales large quantities of iron pyrites. Good samples of the coal were taken, which from its position in the heart of the hills, and from the high inclination of the strata could only be worked at a large expense. In the hills around Baghanwalla, I on two occasions saw an animal known to the natives by the name of *Ouriar*. Once only had I an opportunity of approaching them; unfortunately I had not my gun with me. They roam about in flocks of 6 or 8, the female resembles a small female antelope, but is of stouter make and of a dark brown color. The male is much larger, has the body of a deer, but the head resembles that of a ram. In the individual we saw, the horns were large and curved backwards on the head. He was of a dark brown color and had a streak of long black coarse hair extending from his chin to his breast. They are very wary and but seldom allow people to approach. Poreupines are frequently seen, and leopards are by no means uncommon.

March 29th.—Baghanwalla.—Being anxious to trace the fossiliferous limestone above the coal to the W. of the position where that mineral is best seen, I crossed the highest part of the range of hills behind Baghanwalla, when I came upon the flinty siliceous sandstone, and traced this gradually to the east, until it was covered by apparently a series of sandstone strata forming the low range of hills stretching towards Mt. Doomwala, and through which the small stream, the *Bunnah*, flows, in whose sand gold is collected in small quantity. The fossiliferous limestone is in some places well seen, as also the marl, including the bituminous shales, in which the coal occurs, but owing to the immense quantities of loose stones which have rolled down from the heights, no good sections of the coal seam could be got until within about a mile of the valley before mentioned, where it occurs of best quality and most largely developed. In the neighbourhood of Baghanwalla the following appears to be the order of succession of the rocks composing the range commencing at the base.

1. A compact red sandstone, on which rests
2. The red saliferous marl containing large masses of gypsum, both saccharine and crystallized, and covered with a saline incrustation.
3. A series of red and brown sandstones of various thickness and fineness, with here and there conglomerates.
4. A series of blue slaty soft argillaceous sandstones of considerable thickness, and towards their upper part becoming calcareous, so as to form a bad sort of limestone of a bluish colour.
5. A light fawn-colored limestone of a siliceous character, and devoid of fossils.
6. A thick series of dark blood red sandstones and fine conglomerates, containing nodules of a greenish clay, and interlaminated with thin strata of clay of a blue color. In the sandstones vegetable impressions resembling the fronds of Fuci were noticed, and also ripple marks, but no other fossils.
7. Yellow marl.
8. Bituminous shales with coal.
9. Marl and shell limestone running into a cherty limestone, containing bodies resembling nummulites, and minute shells.
10. Sandstones of a blue and red color stretching to the N. E. and interlaminated apparently with strata of blue clay. These sandstones are only noticed towards the east of Baghanwalla, and seem deficient on the western part of the range.

N. B. *Sungi Momiai* is the local name of coal in this district, and is used extensively by the hakims as a medicine, administered internally along with milk, in all bruises, wounds or external injuries, and it is said with wonderful effect.

Gypsum, known here by the name of *Aberuch*, is not used for any purpose, the natives being ignorant of its properties when calcined.

March 30th.—Returned to Pind Dadud Khan, passing on the way the villages of Gureebwalla, Tudial, Riwal and Kusseli. A practice prevails among the zemindars of this district of ploughing up the paths which exist between the villages, which proves a source of great annoyance to travellers, there being in some places no road or path left. In the evening received visits from the two Missers, who communicated the intelligence of Mool Raj's resignation of office and of Mr. Agnew being about to be sent to Mooltan along with Shem Shere Sing. Left specimens of Baghanwalla coal with Misser Gyan Chund.

March 31st.—Pind Dadun Khan to Choeë, 8 kos.—Crossed the salt range to Choeë. On the southern slope of the range the road is most execrable, but on reaching the ridge or highest point at Dundhote, it somewhat improves—the ascents and descents being of less height, and several well cultivated valleys intervening. From Dundhote to Choeë the strata seem entirely composed of a siliceous flinty limestone, which by atmospheric influence disintegrates into round boulders, which strew the face of the hills and valleys and render the road very bad for horses or camels. As the traffic between the south and north sides of the range at this point is considerable, it is much to be desired that a road were made on which loaded camels could travel with ease,—a project which we should think could be effected without any great difficulty or expense, from the soft character of the rocks, on the south side in particular, where a good road is most required in consequence of the ascent being greatest. All along the southern slope of the range sweet water is abundant, and at Choeë a clear running stream commences and continues its course to the famous tank at Kutass. To the N. W. of Choeë, about 2 miles, is a hill of considerable height called Kuringuli, on the top of which, in a limestone rock, grains or rather small cubical crystals of *Sulphuret of Antimony*?* are found, which is considered of very fine quality, and sells at a higher price here than that brought from the northern countries. Kuringuli appears to be based upon the same flinty limestone as extends from Dundhote to Choeë, but above it are a series of calcareous sandstones, conglomerates and sandstones of a brownish colour, on which reposes the arenaceous limestone containing the Surma, all these strata appearing to dip towards the plain of Dunni to the N. The Surma occurs in but small quantity and is collected chiefly after rain by the villagers, who find it in the channels made by the water running down the ravines. At the very top of the hill, on its south western escarpment, there seems to have existed a small vein of it, a sort of cave having been excavated in the limestone rock, down the face of which the villagers descend by means of a rope to search for the mineral, in which attempts, two individuals have lost their lives in consequence of the cutting of the rope, by which they had suspended themselves, they having fallen into the valley below, a height of at least 200 feet. From the western side of

* Sulphuret of Lead, or Galena. (See Report.)

Kuringuli a series of sandstone strata are seen stretching to the W. forming as it were a natural boundary between the Illaquas of Chungur and Thunni. These strata, as seen from the top of Kuringuli, appear to dip to the N. W. under the plain of Thunni, and rest on the strata forming that hill, being in appearance exactly similar to those seen at Baghanwalla, as stretching towards Mount Doomeyala, and evidently of a more recent character than the strata on which they repose.

April 1st.—Choe to Kutass, 4 kos.—From Choe came unto Kutass this morning, the road leading through a series of valleys surrounded by limestone hills, through which the clear stream of water flows towards Kutass, which commences at Choe and on the sides of which a fine green sward exists. Around Kutass the limestone hills in some places are covered with a recent kind of limestone commonly known under the name of Travertine, and which when burned yields a remarkably white and fine lime, a property of which the natives of this place are well aware, and for which they quarry it extensively. The same *Travertine* is seen at Dundhote, Baghanwalla, &c. resting on the siliceous flint limestone, and frequently contains perfect impressions of leaves, &c. on which the lime forming the recent rock, has been deposited from water, originally holding it in solution.

The difference in the character of the rocks on the north and south sides of the salt range, gives to the vegetation an equally different appearance. On the south side, and where the *salt rocks* occur, the soil is barren in the extreme, but whenever one gets above their influence trees and shrubs occur, giving a green appearance to the sides of the hills in the valleys, between which, especially on the north side of the range, good crops of barley and wheat are raised. At Kutass the famous tank of water is formed in a fissure of the flinty limestone rock, and is said by the natives to be of such a depth that though a faqueer spent two years in making a rope, he could not in that time make it long enough to reach to the bottom of the tank,—a fact, the value of which only depends upon the length of rope he *really* manufactured, information on which point I could not obtain. Being anxious to ascertain if the alledged depth was really correct, I procured a rope about 300 yards long, to which a heavy weight was attached, and entrusting it to a man seated on a charpoy supported by inverted gurrachs, by navigating which on the surface of the tank, I obtained the depths at

several hundred points, but in no case found it greater than 23 feet, a fact which we think disproves its alledged depth, although we have no doubt that a small fissure exists in the bottom of the tank in the limestone rock, by which the superfluous water is carried off to a lower level, there being no apparent exit for the water flowing into it. At present there is an immense concourse of people at this place, which from its beautiful position in the heart of the hills, is well chosen as a residence for faqueers.

April 2nd.—Kutass.—Despatched diary to Lahore, and being Sunday halted.

April 3rd.—Kutass to Kuhar, 10 kos.—Came unto Kuhar this morning, a distance of about 10 kos. The road leads through a series of valleys between a lower range of hills and about 3 or 4 miles from the high ridge of the range. Towards Kuhar the flinty limestone is here and there capped by calcareous sandstone and conglomerates, which to the north become more and more abundant. Kuhar is situated to the W. of a salt water lake in a valley surrounded by hills composed of strata far superior to those yielding salt, which is excavated about 3 miles south from Kuhar at a village called Surdi. This lake is probably identical with the salt lake of the same name laid down in Tassin's map to the south of the salt range. Its water is a perfect brine, but whence the salt is derived could not be ascertained. To the west of the lake the water is sweet and good and in great abundance, issuing from the limestone rock in a clear stream behind the village of Kuhar, and flowing towards the west, a very small portion of it running into the lake; at the eastern extremity of which a small burn which drains a valley near the salt depôt, and which at the time we passed it was nearly dry, appears to enter. The banks of the lake are covered with a saline incrustation, but I could get no information as to whether salt was deposited from the waters in the lake by evaporation, which must be the case if salt springs still continue to flow into it, a fact which we could not ascertain.

The surface of the lake is covered with wild fowl which collect in great quantity wherever the smallest stream of fresh water enters, and in the neighbourhood of which their food is probably found. We could not learn that any fish existed in the lake, the banks of which are formed of a soft foeted blue mud covered with a thin sward. Fevers

are prevalent at Kuhar, and no doubt are the result of the malarious exhalation of the lake. As coal was said to occur to the north of Kuhar, I visited the locality at a place called Narwa, where a clear stream has cut its way to the depth of at least 200 ft. through a series of soft friable sandstones of a greyish colour, interlaminated with beds of red and blue indurated clays, all of which dip to N. N. W. at an angle of 25° , and seem from their general appearance to be identical with those which abut on Kuringuli and stretch west between the Illaguas of Thunni and Kuhoong, their lower strata resting on the flinty limestone which forms the ridge of the salt range. At the bottom of the valley above mentioned and nearly on a level with the stream, *masses* of coal of a totally different character from any hitherto seen make their appearance, but *in no regular seam*, being evidently the remains of trunks of trees which in these strata have become converted into coal of the character of *Jet*, and in which in some specimens the fibrous character of the altered wood is most distinctly seen. This coal occurs in the soft friable grey sandstone, and near it I found distinct marks of leaves in the sandstone (probably those of a palm), destitute however of coaly matter. No other organisms could be found associated with the coal, but in an indurated blue clay above the sandstone indistinct marks of these were observed. The strata above mentioned seem evidently of a more recent character than those to the south, and appear to dip under the plain of the Illaqua of Thunni. On the tops of the hills formed by these strata large deposits of travertine occur of the same character as described at Kuhar, &c.

P. S. Can the small fresh water rivulet which forms the valley of Nurwa be the drainage of the tank at Kutass?

April 4th.—Kuhar to the salt mines of Surdi.—Left Kuhar this morning for the purpose of visiting the salt mines of Surdi on the south face of the salt range, and within a couple of miles of the plain of Jhelum. From Kuhar to the salt mine village of Surdi, a distance of fully 6 miles, the road gradually ascends through a series of cultivated valleys between hills, covered with bushes of an Acanthaceous shrub, probably a species of *Hypoestes*, which abounds on the salt range ground and affords a good shelter to Chicore and Pheasants, the former of which are at this point very abundant. These hills are apparently composed of a continuation of the same series of strata as seen to the

N. of Kuhar, beneath which are a succession of conglomerates of a calcareous character, interlaminated with a limestone much resembling that of Kuringuli where the Surma occurs. Beneath these strata and as one approaches the highest ridge of the range at Surdi, the flint limestone crops out and forms the top of its bold southern escarpment, being deposited in a stratum at least 200 ft. thick, on the northern slope of which is a very richly cultivated valley stretching E. and W. On descending from Surdi the same shell limestone and marl as is found above the coal to the eastward was seen beneath the flint limestone, but the position of the carboniferous strata was completely obscured by the enormous masses of rock which have fallen from the disintegrating limestone above, and which are accumulated between this and the variegated sandstone strata beneath the coal-beds. We are satisfied the same lignite bed occurs here as to the east, and if diligent search were made in the neighbourhood I believe it would be found, although we were unsuccessful, being unable on account of the intense heat to search at various points as we could have wished.

The salt mines of Surdi, three of which I visited, have been more recently opened than those to the east, and appear to be constructed on a better plan; good flights of steps being cut out of the salt to facilitate the ascent and descent of the mine, and the roof of the passages being well supported by cross beams of wood. The salt appears of excellent quality, close to the surface and remarkably compact. These mines are under the management of Peer Mohumodeen, who stated that 40,000 maunds of salt were annually extracted from the mines at this place, and which is sent chiefly to Kashmír and the north.* The salt as it is raised from the mine is conveyed on camels to a dépôt about 2 miles from Kuhar on the road to Kutass, none of it being sent to the south side of the range.

April 5th.—Kuhar to Noorpoor Suhutta, 9 kos.—From Kuhar came on this morning to Noorpoor Suhutta. The road skirts along the foot of the flinty limestone hills and through valleys generally well cultivated, but which seem to be but scantily supplied with water. Noorpoor is nearly S. W. from Kuhar, and situated more on the ridge of the range than the latter place. Around it there is rich cultivation,

* We are inclined to doubt the accuracy of the amount of salt excavated here as stated above.

water being abundant within 8 feet of surface. The flint limestone generally prevails here, being at times capped by the soft friable sandstones and conglomerates which form the lower part of the northern slope of the salt range.

April 6th.—*Noorpoor and Nilawan coal.*—A little to the south of Noorpoor, and above the Nilawan salt mines, the flint limestone forms a precipice at least 150 feet high, beneath which is the same shell limestone as is found in other localities to the E. above the coal beds, and only differs at this point in being more arenaceous. Beneath the shell limestone is the yellow marl, succeeded by bituminous shales at least 30 feet thick, in which two small seams of coal occur 8 inches in thickness and separated from each other by about a foot of shales. The coal is identical in character with that to the eastward, and the carboniferous strata at this point seem only to differ from those to the east in their being a less deposit of coal and a greater development of bituminous shales. Beneath the coal is the usual succession of sandstones, conglomerates, &c. reposing on the red saliferous marls of the Nilawan salt mines, at present closed. Samples of this coal were preserved and sent along with a specimen of the Kuhar Jet coal to the care of Misser Gyan Chund at Pind Dadud Khan, to await my return to that place.

April 7th.—*Noorpoor to Jabba, 10 kos.*—From Noorpoor came on to Jabba, a distance of 10 kos, passing the villages of Monara, Pudral and Pyle—near the latter place, the plain of the Jhelum is distinctly seen, and at this point there is a sort of valley across the salt range, through which a good camel road is said to exist leading to the village of Kutta on the south side of the range. From Noorpoor to Pyle the road is very rough, leading along hills of the flinty limestone, but from Pyle to Jabba the direction is northerly, and the sandstone strata appears forming a more level country than to the south. At Jabba the water is near the surface, and raised from wells sunk about 6 feet in the ground. To the north of the place the strata seem altogether composed of soft friable sandstones, conglomerates and clays, which dip at a very small angle towards the plain of the Illaqua of Chingee, and which are part of the same series as rest on the flinty limestone towards the ridge of the range, and are evidently of a much more recent character. They seem to be comparatively destitute of organic remains, although nodules of peroxide of iron are abundant in them, and which has probably been accumulated around a centre of some organic matter.

April 8th.—Jabba to Tillah, 14 kos.—Being informed there was no road for camels along the first N. slope of the range, marched to Tillah, which is nearly due north from Jabba. Between these places soft grey sandstones and conglomerates, interlaminated with beds of reddish clay, occur, by the desintegration of which a soil is formed which is tolerably productive in the neighbourhood of wells, these being however very scarce to the S. of Tillah, but increasing in number as one descends to that place, which is situated on the N. bank of a dry nullah of considerable size, from the sands of which gold is regularly washed. At a village called Nukha, about 3 miles E. of Tillah, gold is found in considerable abundance in a nullah which flows through a valley enclosed on each side by soft sandstone, in which the gold occurs. The Gambir is the name of the nullah, and washing its sands; about 150 men are constantly employed; a part of the nullah having been fixed upon for the operation, the superficial stratum of sand is removed, and that beneath collected with a wooden shovel and carried to the spot where it is to be washed—generally close at hand. The washing is effected in a long wooden box, resembling a small flat-bottomed boat, wide at one end and narrow at the other, where there is an opening. The wide end of this box or *Troon*, as it is called, is slightly elevated, so as to give its flat bottom a gentle inclination towards its forepart, and a coarse sieve of Sirkee or twigs of wood is then placed on the wide end of the box. On this, portions of sand are from time to time thrown, a stream of water being dashed upon them, by which means the fine sand is washed into the troon, the coarse gravel being retained on the sieve. By continuing the washing, the lighter particles of the sand are carried down the inclined bottom of the troon and escape at the opening in its forepart, while the heavier and auriferous sand assumes the highest level next the point where the stream of water is applied. In a very short time nothing remains in the bottom of the troon but a thin stratum of black magnetic iron sand, by washing which its lighter particles are removed and the auriferous portion concentrated within narrow limits. When this has been washed in the troon as much as is considered safe, it is removed by the hand into a circular concave wooden platter, called a *Pattri*, made of the Tali tree, and resembling a shield. In this, by a circular motion it is agitated with water, by which means an additional portion of the black sand is got rid of and washed away from the in-

clined sides of the *Pattri* by a stream of water skillfully applied. The residue is then rubbed up with a little mercury, which quickly amalgamates with the gold sand, leaving the black portion behind. The mercury containing the gold is then removed from the *Pattri*, enclosed in a fragment of cotton cloth, and placed on a bit of live charcoal, by which means the mercury is speedily vaporized, leaving the yellow gold behind entangled with the tinder of the cloth, from which, by rubbing, it is easily removed. In this state it is taken to the goldsmiths, who by fusing it with borax remove all impurities, which they say amount to 2 *ruttees* per tola weight, a fact however which we are inclined to doubt. The gold of the Gambir is considered of very fine quality, and of a rich yellow colour, differing from the Mokhudd gold, which is said to be *sufaid* (*white*). At Nukha 15 troons are constantly at work, to each of which 8 or 10 men are attached, 2 or 3 being occupied with the operations of washing, while the rest are employed digging the sand and bringing it to the troon. In the two rainy months 3 or 4 tolas weight of gold are collected by each troon, which sells here at Rs. 18 in its crude state per tola. On the Illaqua of Tillah a tax is levied by the Sirkar of Rs. 110 per annum on account of its gold.

The auriferous sandstone strata seem to stretch along the N. side of the salt range, dipping under the plain situated between this and the Hazara country, and extending west to the Indus.

Note.—From repeated enquiries among the gold sand washers I could not discover that *Platinum* occurs, though this is most probable, —these two precious metals being generally found associated. It would remain behind in the heavy black sand after the mercury is removed by amalgamation. The natives, contrary to their usual careful habits, take no means for recovering the mercury used in the extraction of the gold, apparently not being aware that such could be effected. In the Hazara country the grains of gold are sometimes found of such size, it is said, as to be capable of removal by picking them from the sand in which they are contained.

April 9th.—Tillah.—Sunday. Despatched diary to Lahore.

April 10th.—Tillah to Lingewalla, 10 kos.—From Tillah came on to Lingewalla, through a flat barren country, the soft sandstone strata being close to the surface and covered only by a very shallow soil. On this march water is very scarce, though to be found at a considerable

depth. Around Lingewalla there are only 3 wells dug near the bed of a small nullah, and in which the water at present is about 10 feet from surface, and very good. Gold is also collected here, and at Luggur, about 2 kos distant.

April 11th.—Lingewalla to Moulton, 10 kos.—Lingewalla to Moulton, through a country of the same character as previous march, but even more barren. Passed Tamun about 3 miles from Moulton, near which is a nullah called the Unkur, where gold is found. At Moulton gold is also washed from a nullah of the same name, in which are some good sections of the sandstone, conglomerates and clay strata, which dip to N. at an angle of 10°. From Tamun a road leads to Kalibagh direct.

April 12th.—Moulton to Trapp, 4 kos.—Came on to Trapp this morning—a very short march. This village is situated on the W. bank of the river Swauk or Surwauk which is famous for the amount of gold it yields. At present it is but a small stream, being not more than a foot deep and 30 ft. broad. On the road to Trapp passed the villages of Shah Mahomed Walla and Jubbee. At Trapp there is a good deal of cultivation, water being abundant and good near the surface.

April 13th.—From Trapp came unto Mokhudd by a very hilly road. This village is situated on the Indus, and in the angle formed by the junction of a nullah of the same name with that river. At this point the Indus does not appear above 400 yards wide, its course being N. N. E. and S. S. W., and confined by soft sandstone and strata and conglomerates, which rise abruptly from the river, here flowing with considerable rapidity. Conglomerates are at this point very abundant, being chiefly composed of boulders of primitive rocks cemented in a highly calcareous sand. Between Trapp and Mokhudd in many places are deposits of diluvium full of rolled boulders of rocks of all ages, apparently increasing as one approaches the Indus. Among these we obtained a beautiful species of *Delphinium*, which we have not observed before on the salt range. At Mokhudd the gold washing is carried on extensively both in the sands of the Indus and nullah of same name. According to Herr Bilas kardar, in the year 1844, 409 tolas of gold were collected, on which Rs. 1280 of tax were levied by the Sirkar.

In 1845, 272 tolas, tax Rs. 988.

In 1846, 332 tolas, Do. Rs. 990.

At present the tax is Rs. 3-2 annas per *tola* of 12 annas the rupee.

Great complaints were made by the sand-washers of their being almost bound to sell the gold they collect to the *Bioparees*, who they say will not pay them in money, but only give them an equivalent in the shape of food and clothes. The gold here sells at Rs. 15 the *tola* of 12 annas the rupee. The inhabitants of this place are described as a very lawless set, and not at all inclined to pay attention to the orders of Herr Bilas the kardar, who says he has much trouble with them.

No coal is known to occur in this neighbourhood, the rocks being all of a comparatively recent date. Sulphur occurs at Jubba, 18 kos from Mokhudd on the Indus.

Mulk Ullah Yar Khan, jageerdar of Kalibag, came with his son to meet me here, and presented a nuzzur of 11 Mahomed Shah rupees. He stated that Captain Christopher took with him on his downward trip in the Indus steamer 120 maunds of coal from Kalibag, two kinds of which there occur.

April 14th.—*Mokhudd to Kalibag by water, 12 kos.*—From Mokhudd came down the Indus in a boat in $3\frac{1}{2}$ hours, the distance to Kalibag in this way being 12 kos, while by land it is said to be 19, and the road very bad, the villages of Kau, Miker, Shucker and Musan intervening. From Mokhudd to Kalibag the river is confined within narrow limits by the soft sandstone strata, which at the former place are nearly horizontal and of moderate height above the river, while towards the latter locality these ascend at a considerable angle, and at Dunghote, 3 miles from Kalibag, form barren rocks of great height, which overhang the river on each side and seem to stretch to the W. forming a high range of hills. The course of the stream above Kalibag seems very free of shallows or rocks, and apparently is of great depth, flowing with a considerable current. Two miles below Mokhudd, on W. bank of the river, is a small village, Ruckwan. Three miles lower down on E. side is the entrance of the Swank river, a kos below which is the small village of Peer Pyai; below this on opposite side are the villages of Goli and Tulliah, from which latter place the strata on each side of the river rapidly ascend to Dunghote, dipping to N. at an angle of 35° . Below Dunghote the salt mines appear on both sides of the river,

the salt mine village of Maree being on the E. bank, and about a mile above Kalibag, where the Indus escapes from the hills and increases in width as it flows through the level country of the Esan Khails on W. and Kucha on E. side. Kalibag is but a small place, built on the W. bank of the Indus, and close upon the river, its houses rising one above the other in terraces on the side of a salt hill. The alum kilns form the most striking feature of the village—their red mounds rising here and there in the middle of the town. This, along with various manufactories of iron goods and cloths, constitute the chief employment of the natives, who seem to suffer from goitre to a great extent, numerous individuals being seen walking about with tumours on their necks as large as their heads.

In Kalibag there are 14 alum works, 12 of which are at present working. The alum is prepared from a black, highly bituminous shale called *Roł*, containing a quantity of iron pyrites, and which is brought from Cheetah, about 2 miles distant, and several other localities in the hills around Kalibag. This shale is coarsely powdered and deposited in layers about a foot thick, between each of which a thin stratum of brushwood, grass or other combustible material is placed. These layers being piled up to a height of 20 or 30 feet are set fire to, and the whole allowed to burn slowly, water being from time to time sprinkled on the mass, to facilitate the reaction of the ingredients in the kiln on each other. When the combustion is completed, which occupies 6 or 8 months, according to the size of the kiln, the shale has assumed a brick red color and its surface is encrusted with a coating of alum mixed with sulphate of iron. This burnt kiln affords the materials for the alum preparations, and portions of it are deposited in a baked earthen vat, which is constructed close to the kiln, and a little below the level of its base, and in it are lixiviated with water. When this is saturated with the crude alum, it is run off by an opening in the lower part of the vat, into another one of the same dimensions and character, when any muddy particles are allowed to settle. After being allowed to rest in 2nd vat for 6 or 8 hours, it is then slowly run off into another smaller one in a lower level, and close to a large evaporating iron pan, into which the alum liquid is conveyed, and when boiling mixed with a brownish earth which is here called *Jumsau*, and appears identical with the saline incrustation abundant in all jungles in the N. W.

provinces, called *Reh*, and which is a mixture of sulphate with carbonate of soda. When a proper quantity of this has been added, which is judged of from the appearance of the liquid, the whole is allowed to settle and the clear liquid then removed into smaller earthen vats, where it is allowed slowly to crystallize for several days. By this means crystals of alum are separated of a small size and pinkish color from the brown impure mother liquor, from which they are removed, and allowed to dry for a short time. These crystals are then fused in their own water of crystallization in an iron pan, and when in a fluid state are removed into gurrals, where for 8 or 10 days they are allowed to crystallize. The solid mass of alum in the interior of the gurrah is then pierced with a pick and the gurrah inverted so as to allow any uncrystallized alum liquor to escape. The gurrah is then broken, and the alum moulded to its form, removed to the dépôt for sale or exportation. It is generally of a light brown colour and evidently contains iron and other impurities.

By acting on successive portions of the kiln in the above way, the whole is by degrees converted into alum of marketable quality.

A kind of alum called *Kaee*, is prepared for dyers from a light grey shale containing silky crystals, of what appear to be sub-sulphate of alumina. This shale is coarsely powdered and dipped in the liquor separated from the small crystals of alum. It is then removed and dried in irregular shaped masses of about a seer weight each, which are of a brownish color. When dry these get a second dip in the same alum liquor, and are again dried, becoming of a tawny yellow colour, in which state they are sold to dyers at 8 annas per maund.

The shale from which this variety of alum is manufactured is found associated with the other alum shales around, but in moderate quantity. Its price is 5 annas per maund. In Kalibag there are about 12,000 maunds of alum manufactured annually, which here sells at Rs. 3 per maund. The average daily expenditure in all the alum works in the village is stated as Rs. 12.

Note.—The *Rol* or alum shale is landed by workmen at the alum works in Kalibag, at prices varying from 14 to 17 maunds the rupee, according to the distance it has to be brought, the workmen being supplied with mining instruments.

The price of the *Jumsau*, or earth which is added to the crude alum

liquid, is $3\frac{1}{2}$ maunds for the rupee of 13 annas, which is universal here.

The lixiviating vats are 12 ft. square by 1 ft. 5 in. deep.

The evaporating vats in which the small crystals of alum are deposited are 8 ft. 8 in. long, 5 ft. 5 in. broad and 1 ft. 5 in. deep.

The gurrahs in which it is finally crystallized are 1 ft. 8 in. deep, the same breadth at shoulder, and 6 in. wide at mouth.

April 15th.—Kalibag.—Visited the salt mines here, which are situated on both sides of the river above Kalibag at a village called Maree. The rock salt forms a hill between Kalibag and a nullah called the Loon, which enters the Indus opposite Maree on the N. side of the river, and is worked at various points from the surface, there being no need for sinking mines, the rock salt having tumbled down in immense masses from the heights above, requiring only to be broken into portions fit for removal. The salt is of excellent quality on the E. side of the hill, but on its west side is mixed with a great deal of red marl which deteriorates its quality. The stratification of the salt is more apparent here than in any place we have seen to the E., and dips to N. W. at an angle of 40° . The marl is interlaminated with a strata of gypsum, which generally is of an earthy character, the saccharine gypsum being less abundant than in salt marls to the east. The principal salt workings on the N. side of the Indus at Kalibag are in the bed of the *Loon* nullah, and on its W. side, the soft sandstone strata rising up into a high range stretching N. on its E. side. About a mile from the mouth of the nullah thin strata are seen crossing its beds and extending along its W. bank, reposing on other sandstones and conglomerates, containing masses of siliceous limestone and primitive rocks. Beneath these in regular succession appears a deposit of the same white siliceous limestone with fossils, as seen to the E. and of great thickness, its lower strata being arenaceous and succeeded by an immense development of bituminous shales charged with pyrites and containing small seams of coal, none larger than we saw than $\frac{1}{4}$ of an inch to $\frac{1}{2}$ an inch thick. This is the shale from which the alum is made, and in it regular shafts are sunk, from which the shale is excavated; one I measured having a depth from surface of 207 feet. The working of the shale is attended with frequent accidents, from the loose nature of the strata which are constantly tumbling into the shaft. Here and there the shales are interlaminated with beds of indurated calcareous

clays which abound in fossils, these being also detected in the shales. At this point, known by the name of Chutali, one of the alum-shale shafts spontaneously took fire 5 or 6 years ago, and has since been steadily burning, and from the mouth of the mine a column of smoke is at present constantly issuing resembling that from the funnel of a large steamer. The fire is evidently the result of the chemical decomposition of the iron pyrites in the shale, an occurrence not at all unfrequent in British Colleries. No workable seam of coal occurs here as far as we could discover, its place being supplied by the extensive deposit of bituminous alum shale. Beneath the shales several strata of calcareous sandstone, conglomerates of older rocks and a succession of brown and red sandstones, which to the W. side of the salt range become mixed with an extensive series of red and blue clays, and bituminous shales, some having the appearance of a coarse coal, and containing loose masses of a species of coal resembling jet, which may be picked out of the shales in considerable quantity, but has none of the characters of a regular coal seam. About 40 or 50 maunds of this *jet* or fossil wood, and about the same quantity of bituminous shale, supposed to be coal, were taken as fuel by Capt. Christopher in his downward voyage in a steamer from Kalibag. The extensive development of bituminous shales in the position here noticed among the variegated sandstone strata above the salt, is quite different from what is seen in the salt range to the E. as far as we have examined, these being almost entirely confined to a position between the variegated sandstones and white siliceous flint limestone, being apparently a number of the latter deposit. Beneath the variegated sandstone shales, seemed conglomerates of immense thickness, reposing on a light colored argillaceous limestone, between which and the salt marl, are various red and brown sandstones and indurated red clays. All these strata, from the siliceous flint limestone downwards to the salt, seem to dip to the N. W. at an angle of from 40° to 45° , but in several places shew marks of having been subjected to disturbing agencies.

Note.—The alum shale from both sides of the salt range is carried on bullocks from the mouth of the pits to Kalibag, and if a seam or seams of such lignite as is found at the various points already noticed to the eastward would be discovered, it could be excavated in the same way as the shales and removed to Kalibag at a trifling expense.

April 16th.—Kalibag.—Sunday.

*April 17th.—Ditto.—*Unable to go out in consequence of heavy rain. Iron is manufactured about 30 miles to the W. in the hills at a place called Kamgoorum. Wood charcoal is used for the fusion of the ore. The iron is brought to Kalibag in coarse lumps of pig iron, and is of very inferior quality.

*April 18th.—Kalibag.—*Visited the alum shale locality of Cheetah in hopes of discovering a seam of lignite, but was unsuccessful, the coaly matter being generally disseminated through the shales. In a calcareous blue clay interlaminated with the shales, fossils are abundant, as well as in the calcareous strata above and below these.

Petroleum is found at a place called Jabbee, on the S. of Indus, 7 kos from Kalibag, among the hills. It exudes from the rocks and floats on the surface of water, where it is collected in quantity, and burned by the natives around in place of oil in their lamps. It is known under the name of *Gunduk ka tal*. From the description of the locality where it is found, we infer it exudes from the neighbourhood of alum shales, and is probably the result of the spontaneous combustion of these strata, during which it exudes to the surface along with watery vapour. It is of a dark brownish colour, the most penetrating smell and burns with a yellow and smoky flame. Its medicinal properties do not seem to be known to the natives, who use it only as a source of light in their lamps. At Jabbee sulphur is also found in small quantity.

*April 19th.—Kalibag to Gurree, 8 kos.—*Left Kalibag and crossed the Indus, after which came on to Gurree, the road running S. S. E. parallel with the salt range, and about 2 miles from its base, through a jungly country of little interest. In the district there is a great scarcity of water, this article being only found around the villages, the principal of which is Daukhail, 3 kos from Kalibag. At Gurree there are two wells, but only one yields water fit for drinking; the water is reached at 20 feet from surface, and hence a large supply might be procured were more wells dug.

At Tuttee, a small village 3 miles from Gurree, the *Jumsau* used in the preparation of alum, is procured. An efflorescence is scraped from the surface of the ground in the jungle around, its soluble part dissolved by water, and the solution dried up in the sun in gurrachs, is what

is sold to the alum manufacturers of Kalibag as Jumsau. The efflorescence is called *kullur*, that of the jungle forming *Jumsau*, while the *kullur* of the village is said to yield nitre.

April 20th.—Gurree to Musakhail, 10 kos.—From Gurree came on to Musakhail, through the same jungly country as in last march, where water is very scarce. The only village passed was *Swas*, about 3 kos from Gurree; from the former place the range takes a turn to the E. running again S. towards Musakhail, which is a small place in the middle of the jungle, with but little cultivation around it, and no wells, water being obtained at the foot of the range, above a kos distant, from a small stream of water which issues from the limestone rocks.

April 21st.—Musakhail.—Having heard that coal occurred at Numbhul, 3 kos distant across the hills, halted for the purpose of visiting the locality. The range at this point seems formed of limestone and highly calcareous sandstones. At a place called Bukh, nearly opposite to Musakhail, and about 2 kos from that place, bituminous shales occur beneath the white flinty limestone which forms the crest of the range. These shales are developed but to a small extent, and contain but a trifling amount of coal, having the appearance of a coarse charcoal, which also occurs in thin lamina in a white calcareous sandstone immediately beneath the shales, which are charged with alum and sulphate of iron. The coal is found in no regular seam, but rather in detailed fragments among the shales, and hence is quite unlikely to be of any use in a commercial point of view. From the shales downwards to the foot of the range on W. side is a development of calcareous strata, which we have observed nowhere in the range to the same extent near the shales; these may deserve the name of calcareous sandstones, but generally the rock is a fine-grained siliceous limestone containing flints, and towards its lower part abounding in fossils. From top to bottom of the range the strata all dip to the N. E. at an angle of 45°, and excellent sections are exposed in the valley, through which the stream of water flows which supplies Musakhail. This water has a milky color resembling that of the Indus, which results from its containing a quantity of calcareous mud, which a little alum very rapidly removes, rendering the water perfectly clear.

April 22nd.—Musakhail to Dwoda, 12 kos.—From Musakhail came on to Dwoda, by a road or path leading along the foot of the hills,

and covered with loose stones rolled from the heights above. Towards Dwoda, the range of hills increases in height, and here and there towards their base, the salt marl makes its appearance. Around Dwoda, which is but a small village, the water is salt, the supply of drinking water being obtained 2 kos distant in the hills, from a small spring which issues from the limestone strata,—all that flows from the strata inferior to these being charged with salt.

Rock salt occurs here, but is not at present excavated except surreptitiously, by the villagers around, who are generally a lawless set of Pathans.

Towards the foot of the hills in this and last march several fields of perennial cotton were seen, the plants being very green, but small.

April 23rd.—Dwoda to Vurcha, 8 kos.—From Dwoda came on to Vurcha—a small place situated at the foot of the hills. It is very ill supplied with water, which is found about a kos distant in a small stream which issues from the limestone strata above the salt marl, and is the only source of fresh water near—any which issues from the hills at a lower level being quite salt. The benefit of a small tank in which the fresh water might accumulate here would be immense; and as good materials for its construction are at hand, its expense would not be very great. At Vurcha there is a salt mine superintended by a Munshi of Misser Rulla Ram.

April 24th.—Vurcha to Khond, 12 kos.—Marched to Khond, over a most execrable road covered with loose round stones, which have rolled down from the hills above. Passed the villages of Chooah, Dokh, Jubbee and Chunkie. At the former place there is a small kutchra tank made for the use of villagers, most of whom are employed excavating salt, which is found in the red marl above the village. At Khond water is also very scarce, being as at Vurcha, only obtainable in small quantity as it issues in a small stream from the limestone rocks. Wells sunk at the foot of the hills afford only brackish water, quite unfit for use.

April 25th.—Khond to Naree, 10 kos.—Came on to Naree. From Khond the road leaves the hills and passes through a level cultivated country, where water however is very scarce. At Naree, a jageer of Shum Shere Sing's, there is a kutchra tank of water for the supply of the villagers. The water is brought by a conduit from Kutta, about

2 miles eastward near the hills, and where a small stream of fresh water flows. In the tank it is very muddy but sweet. Passed the villages of Vahur and Pindee, the former 3 and the latter $3\frac{1}{2}$ kos from Khond.

April 26th.—Naree to Kuhanee, 14 kos.—From Naree marched to Kuhanee—the road level, and leading through scanty bush jungle which is cleared away around the villages, the soil appearing to produce good crops of wheat and barley. Passed the villages of Tulookur and Tessowal, the former 3 kos the latter 5 kos from Naree. Both are villages of some size, but ill supplied with water from imperfect kutchas tanks. At Kuhanee there is a kutchas tank of considerable size, being filled from the Jhelum, which is about 4 miles distant, and in which the water is sweet and tolerably clear.

April 27th.—Kuhanee to Ahmedabad, 7 kos.—Came on to Ahmedabad, a town of considerable size, situated on a branch of the Jhelum. Between Kuhanee and this place the country is well cultivated, and about 4 kos from the former is Lungur, a place little inferior in size to Ahmedabad, and about a mile from the Jhelum. Between these two places, and gradually approaching the Jhelum to the E. of Ahmedabad, are high clay banks, which about 120 years ago were those of the branch of the Jhelum which now flows to the S. of the town.

28th April.—Ahmedabad to Pind Dadud Khan, 10 kos.—Reached Pind Dadud Khan. From Ahmedabad the country is flat and covered with a saline efflorescence, which seems destructive of vegetation. Passed the villages of Surobee, Rolpore and Kourah. The former is considerably to the left of the road, and near the hills. On reaching the place received the news of an outbreak having occurred at Moultan, and of a European Regiment and one of Native Infantry having been ordered to march on that place. Drew on Misser Gyan Chund for Rs. 100, and directed him to give an advance of pay to the 6 Sowars and Munshi who accompany me, to the amount of Rs. 5 each, they professing to have no money to pay their expenses.

April 29th.—Pind Dadud Khan.—Dispatched diary to Lahore yesterday. Received a visit from Misser Gyan Chund, who informed me that 2 sahibs had been wounded at Moultan, and that the whole country was in rebellion.

A new locality for coal has lately been found at Mukrass, 3 kos from Dundhote. It is of the same character as the coal of other places

around Pind Dadud Khan, but of an inferior quality, containing much brown half decomposed vegetable matter.

April 30th.—*Pind Dadud Khan to Reipoor, crossing the Jhelum, 5 kos.*—Left Pind Dadud Khan this morning, and crossed the river to Reipoor, where I encamped. Reipoor is about 4 miles above Pind Dadud Khan, and at this season boats cross the Jhelum most easily at this point, the passage at Meanee being very troublesome from numerous shallows in the bed of river, and the existence of numerous deep nullahs between the chief branch of the river and Pind Dadud Khan.

May 1st.—*Reipore to Phiekie, 12 kos.*—From Reipoor to Phiekie, a rather long march. Water here slightly brackish, in wells 50 feet deep. Temp. in tent 100°.

2nd May.—*Phiekie to Kumira, 12 kos.*—Phiekie to Kumira, through a jungly country. Water abundant and pretty good. Ther. at 101°.

3rd May.—*Kumira to Ramnuggur, crossing the Chenab, 7 kos.*—From Kumira came on to Treka, and from thence struck off to the right to a village named Sarun, close to the bank of the Chenab, where I got into a boat, and after 4 hours on the river, reached the S. bank and came on to Ramnuggur. At this season the Chenab is greatly flooded and full of shallows, which renders its navigation highly troublesome; camels are ferried across the river about a mile above Sarun, but to get to it there are several deep nullahs to be forded. At Ramnuggur put up in the Bara-derry, which only requires to be furnished with doors to make it a very snug residence.

4th May.—*Ramnuggur to Oodewalla, 10 kos.*—Temperature most intense, 106°. Water bad, but abundant.

5th May.—*Muttoo, 8 kos.*—Oodewalla to Muttoo. Temperature in tent 108°. Water has a slight smell, but is abundant.

6th May.—*Suntipoora, 7 kos.*—Muttoo to Suntipoora, where water is abundant and good. Temp. 104°.

7th May.—Came on to Pind de dass ka kote, in the morning, and rode into Lahore in the evening.

* * * The *kos* mentioned in the above diary may be reckoned at $1\frac{1}{4}$ miles.

*Note on the Limits of Perpetual Snow in the Himalayas. By Capt.
J. D. CUNNINGHAM, Engineers.*

I have just read Lieut. R. Strachey's interesting paper on the limits of perpetual snow in the Himalayas,* in which he satisfactorily establishes that the elevations hitherto assigned to the phenomenon have been under-estimated, and that in truth snow is only to be permanently found at about 15,000 feet, on the southern, and at about 18,000 feet on the northern boundaries respectively, instead of at about 13,000 and 16,500 feet, as hitherto supposed. Lieut. Strachey very well shows that Humboldt has attached undue weight to the casual or partial observations of travellers and others in fixing upon the smaller numbers, but he appears to me to be himself in error when he assigns the greater elevation on the northern side almost solely to the smaller quantity of snow which there falls, although he is pleased to attach value to my testimony that such quantity is indeed relatively small, and thus to make me in a way a supporter of his theory.

Humboldt's view of causes correct.—Humboldt, in his "Cosmos" (Sabine's Trans. I. 328,) enumerates the contingencies on which the limits of the snow line are dependent, and to me he seems truly to refer the superior height on the northern side of the Himalayan chain to the general elevation of Tibet, i. e. to the heat due to radiation and reverberation even at that great height above the sea. This view is strikingly borne out by what that able officer, the late Dr. Lord, observed with reference to the Hindu Koosh.† He found the snow lying very much lower on the northern than on the southern face, and he gives as a reason for the large difference the existence of the high lands of Cabul on the south side, or the fact that these high lands contain latent heat which melts the snow, while on the northern face the slopes merge into the swampy flats of Toorkistan, scarce 500 feet above the sea, and are thus met by a cold atmosphere, down to a low level, in aid of the coldness due to a northern aspect.

* Journ. As. Soc. of Bengal, No. 102, April, 1849.

† Reports on Sindh, Afghanistan, &c., by Sir A. Burnes, Lieut. Leech, Dr. Lord and Lieut. Wood. (Geographical Memoirs, p. 48, &c.)

Relative heights on extreme edges of mountain belts.—It will indeed be found that in any *broad mountain chain* resting on a plane inclined to the sea level, and running nearly east and west, the effect of latitude on temperature may be discarded, and that elevation above the particular country, and not above the general ocean, is mainly, although not solely, to be considered in determining the limits of perpetual snow on the two edges of the belt. The line of snow will rise as the plane of the country rises, and keep above it at a continually decreasing distance, until the diminishing temperature due to increasing height causes the two to coincide—a phenomenon which of course cannot occur in the temperate zones, as we know of no table-land so high as to be always frozen on the surface.

Relative heights on opposite sides of the same single hill of a chain.—This reasoning does not however apply to the limits of snow on the northern and southern slopes of any *one hill or mountain*, of a broad and complex chain, and as a rule, the snow will be found to lie lower on the northern than on the southern face of a single peak. In such an instance neither difference of latitude nor inclination of plane can ordinarily have any effect, and the only element to be taken into consideration is the direct play of the sun's rays, which in the northern hemisphere have most power on a hill side looking to the south. Captain Hutton, in his papers on Dr. McLelland's *Journal of Natural History*, had such isolated hills in view when he asserted that the southern limit of snow was higher than the northern one, and when he sought the support of my experience on the subject, as I was then, 1842, moving about in Ludâkh and Kunâwur.

Description of illustrative sketch.—The accompanying sketch represents what I believe to be the true state of the case with regard to the Himalayas, whether a line be drawn north and south across them, between the Gogra and Ganges, or east and west in the neighbourhood of Cashmîr. Towards the plains of India the limit of snow on the southern sides of the extreme hills will be found at about 15,000 feet above the sea, as Lieutenant Strachey shows, and on the northern face of the same hill, at about 12,000 feet, a figure however which I have assumed for the sake of illustration, as I know of no observations directly bearing on the subject. On the Tibetan side of the chain the heights will be found to be about 20,000 feet on the south, and 18,000,

or 18,500 feet on the north face of the same hill. These latter estimates are Lieut. Strachey's, and they are, I think correct, while the southern height of 20,000 feet is an approximation only.

I have taken the height of the Manasarawar lake, viz. 15,000 feet, in making this sketch, but even Humboldt's mean elevation of Tibet, viz. 11,500 feet (Cosmos, I. 330,) will not affect the argument, that the distance between the planes of the mountain bases and of the snow limits goes on decreasing as the former ascend.

Quantity of snow falling in Tibet, and the permanency or renewal of snow generally.—With regard to the quantity of snow which falls to the northward of the main peaks of the Himalayas, I may refer to my statement at p. 238, of the 148th No. of the Journal, where I say that it did not appear to exceed two feet and a half in depth, where not drifted. This refers to the tract around the junction of the Sutlej and Spiti rivers. In addition to the details there given, I may also mention that the larger streams began (in 1842) to swell after the middle of February. This was due, I would say, to the radiation from the mountain masses causing the lower surface of the snow to melt—the recently accumulated snow itself forming a protection against the chilling winds, and so allowing the earth to part with its heat. At this period the temperature of ordinary springs was about 42°, while the air at sunrise was sometimes below zero, and the mercury would not rise above 60°, when exposed to the sun's rays in the early part of the afternoon. I state these particulars partly in support of what I consider to be Capt. Hutton's meaning with regard to snow not being perpetual—an opinion to which Lieut. Strachey somewhat slightly alludes.* Both observers are right, because the one simply means that the snow is ever being simultaneously destroyed and renewed, and the other that hills of a certain elevation always exhibit a covering of snow.

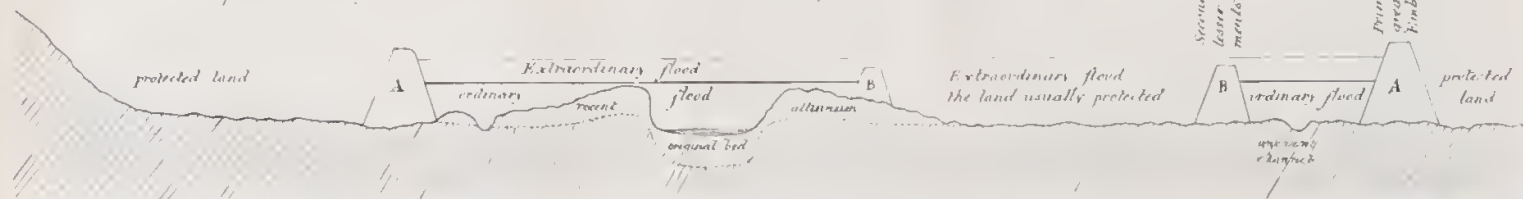
The Tibet of the Himalayas not a plain or table-land.—Lieut. Strachey, and indeed most people, talk of the "plains" or table-land" of Tibet, but I doubt whether between Imaus and Emodus, or any where in the valleys, or basins of the Indus and Brahmaputra to the north of the Himalayas, there are any plains. The range separating the upper courses of the Indus and Sutlej is indeed inferior in height to that which gives rise to the Ganges and Jumna, but it is still a lofty

* Journ. As. Soc. of Bengal, April 1849, p. 302, note.

No 1

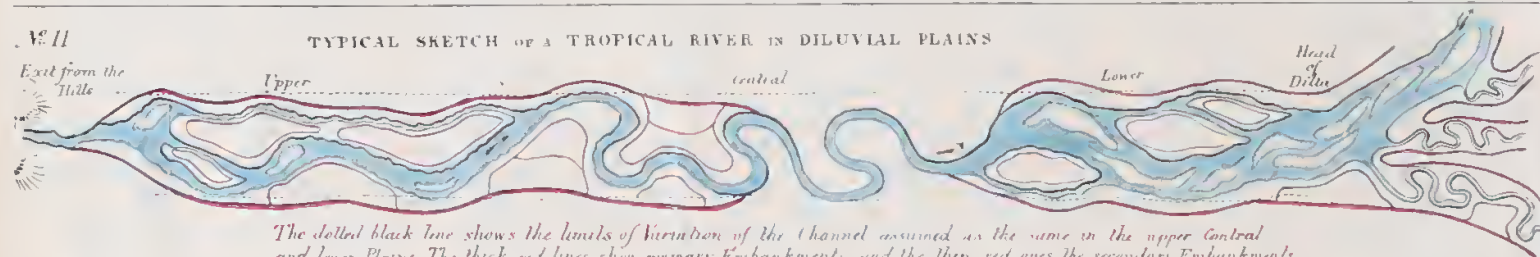
A—Primary or greater Embankments
on limits of Belt of Variation to
protect the Country generally

B—Secondary or lesser Embankments
to protect limited tracts within
the Belt of Variation

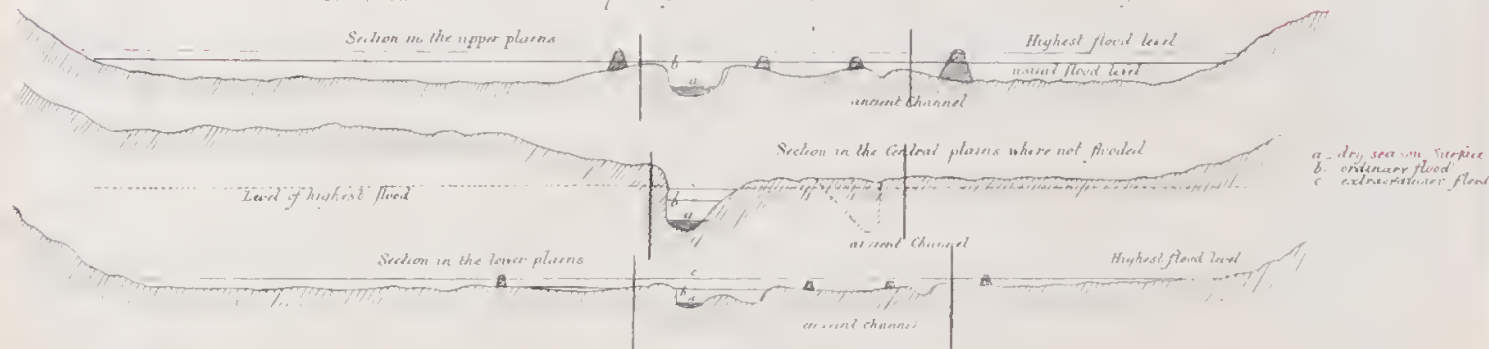


No 11

TYPICAL SKETCH OF A TROPICAL RIVER IN DILUVIAL PLAINS



The dotted black line shows the limits of Variation of the Channel assumed as the same in the upper Central and lower Plains. The thick red lines show primary Embankments, and the thin red ones the secondary Embankments.



The perpendicular red lines represent the breadth of the belt of Variation

range. To the northward of the Indus, or on a line running from Garo towards Yarkund, I dare say that undulating ground or moderate slopes, rather than deep ravines with steep sides, may perhaps be found.

These downs or steppes, or at least tracts, afford pasturage to the best description of shawl-wool goats, and Lieut. Strachey is right in his opinion that, elevated although they be, they are as free from snow during summer as the plains of India. What he supposes of the Kailás or Gagrí of the Manasarawar lake, viz. that the height of its (northern) snow line may be 19,500 feet, would also be fully verified on any mountains which may break the sameness of these steppes, and not be so far to the north as to be much affected by the latitude.

On the Embankments of Rivers, and on the Nature of Overflowing Rivers in Diluvial Plains. By Capt. J. D. CUNNINGHAM, Engineers.

A short time ago I addressed the Editor of the "*Englishman*" about the embankments of the Damooda and other streams, and partly because my propositions were well spoken of by that paper (see issue of the 31st May, 1849), I am induced to write to you more at length on the general question of such dikes, and also to make my views more plain by a few illustrative sketches.

Proposed Scheme of Embankments.—My scheme is founded on the fact that rivers, how capricious soever they may seem to be in any one neighbourhood, do nevertheless on the whole usually wind or vary within given limits, or will ordinarily be found to flow between lines parallel, at an ascertainable distance—although in their deltas and in the upper portion of their courses, they do also, after long periods, occasionally quit such belts of petty variation, and strike out new channels for themselves at considerable distances to the right or left. Hence, disregarding these latter changes as not giving cause for yearly care, I recommend that there should be two sets of embankments, one primary, and of a large section, following generally the limits of the belt of variation, and the other secondary and smaller, surrounding islands, or covering detached portions of land within the belt, which can be enclosed without materially impeding the flow of an ordinary inundation. By keeping

the larger embankments beyond the limits of constant change, all risk of having them attacked by the fluctuating stream will be avoided, and regard will merely have to be had to sustaining the pressure of a tranquil flood or of a given height of water; while by employing minor embankments likewise, much valuable land may be kept under the plough, except on the occurrence of great floods, which perhaps only take place at intervals of ten, twelve or twenty years. (See Pl. XVI. sketches I. and II.)

The upper courses of rivers in Diluvial plains.—In explanation of this scheme it is necessary to recapitulate the distinguishing characteristics of rivers subject to flood and running through diluvial plains. Rivers on quitting the hills rush over the surface of the plains like water spilt upon a table. The channels are shallow, and are at first formed partly by tearing up the soil below, and partly by depositing the coarser materials brought from the hills to the right and left. As banks become formed, the process of deposition is modified into leaving the coarser debritus in the bed of the stream, which is accordingly raised, and the waters being impeded by the diminution of slope, seek a new channel on the original plain to the right or left of that first chosen. In large and constantly flowing streams this process is repeated until at last the general surface of the country is so much raised that the river is effectually controlled by the mass of its own deposits, and gradually sinks within them, limiting its changes to a series of reflections between two lines, parallel, as in large rivers, at five, eight or ten miles apart. In the case of small, and occasional streams, however, such as the hill torrents between the Ganges and Jumna, such adjustments of channel will never perhaps take place, and these brooks of a rainy day scarcely even now know which of the two rivers to seek, while in the case of others of greater size, as of those descending from the Burdwan and Beerbhoom hills, the settlement is in steady progress, sometimes aided or retarded by artificial “bunds” or embankments. Thus the accompanying sketch No. III. (Pl. XVII.) shows the instance of the Bânsli Nullah, which joins the Bhagiruttee near Jungypore, and sketch No. IV. shows the instance of the More, which joins the same river between Moorshedabad and Cutwah. The old channels from A to B, toward C, had become so raised with coarse sand, assisted in the case of the More by embankments, that the *surface* of the country on either

side was but little above the *bottoms* of the respective hill streams. The mass of waters was thus sustained in the air by natural and artificial means, and perhaps on the occasion of a great flood, finding a lower level within a given distance, as in the direction of a parallel stream, than down their own channels, they at once struck out new courses for themselves towards D, as shown in the sketches. The change in the More took place during the present generation, but thirteen years ago when last seen, it had made but small progress in forming a well defined bed in the lower portions of its new course, and it had covered about twenty square miles of good soil with interlacing ribbons of barren sand. Frisi mentions similar occurrences in the smaller rivers of upper Italy, and even in the Po itself.*

Courses of rivers in the central plains.—At great distances from the hills, the velocities of streams decrease, large quantities of debris cease to be borne, and the rivers continually endeavor to sink themselves to the final level of the ocean. Hence when the soil through which they flow is of a firm character, their channels become deep and regular in section, and the uncertain reflections of the upper portions are converted into well formed windings. But the tendency of these windings is to be cut through at the neck, and the variations of channel are thus kept within limits greater or smaller according to the size and force of the river, but usually somewhat narrower than in the upper plains. Generally speaking, in these central tracts rivers do not overflow the country, as in the case of the Ganges about Mirzapore, but the tortuous courses of smaller streams are sometimes invaded by the inundations of greater rivers running parallel to them. Thus in sketch No. IV. the winding course of the Qweea has now become submerged by the waters of the More, as the old channel of that river (below C) has long been by the inundations of the Bhagiruttee.

The courses of rivers in the lower plains.—As rivers approach the sea they for the most part flow through plains of small descent, and which are

* *Frise on Rivers*, p. 20. It may be doubted whether the Ganges has yet become finally settled in its belt of variation with reference to the Jumna, which latter river I consider to run on a lower level than the Ganges. Thus with a little aid from art, the one might very likely be led from near Cawnpore into the other below Calpee—a change which would shorten the new canal, if it is to be used mainly for navigation, as it should be.

formed of an alluvium deposited by themselves and their affluents, which has but little coherence. The resistance offered by the soil is no longer nearly equal to the impetus of the main current, and hence all symmetry of channel is lost, and the rivers resume some of the characteristics of their upper courses, wandering over sand banks from one low shore to the other, or during floods covering the whole country with a slow moving inundation. Still the mutual action, and reaction of the stream and banks tends to establish a variation within limits, and the breadth of the belt of change can always be ascertained, and will usually be found to exceed its measure in the central plains. But disregard must be had to such alterations as that which may take the Ganges into the Nattore Jheels between Bauleah, and Dacca,* and which would correspond in cause and character with those changes of the Bânsli and More above described. Again, after rivers begin to form deltas, the principal streams mostly continue to move onwards in their irregular courses, but the smaller outlets having necessarily a diminished current, may perhaps meet with so much resistance as to cause them to wind, as is the case with the Bhagiruttee, Jellinghee, and other effluents of the Ganges.†

Some rivers do not exhibit all of the characteristics above described. The Ganges is a good type, but the Indus and Sutlej nowhere become regularly winding, as neither does the Damooda, the proper embankment of which is an object of so much concern. The Jumna again merges in the Ganges after passing through two, and the Soane after apparently passing through one only, of the distinguishing conditions.

The limits of the variation of rivers dependent on dynamical principles.—The limits of the deflections or windings of rivers can be determined on dynamical principles. The elements of calculation are, a

* Rennell's Memoir of a Map of Hindostan. Appendix, p. 345.

† Branchings off must always take place at an *angle* to the direction of the *stream*, although sometimes they may almost form a continuation of the adjoining, or producing *each* of the parent river. Hence the water enters the branch with a reduced initial velocity, or occasionally with little more than with what is due to its height as a column of fluid, and being unable to carry forward the whole of the detritus with which it is charged, the coarser portions are deposited and the head of the effluent becomes raised above the bed of the principal stream. Thus the head of the Bhagiruttee is always, as we say, "choked with sand."

wider or narrower stream with a momentum due to gravity, ever impelled in the direction of the lowest level, and passing through a resisting medium of earth, or sand or gravel. The river is first deflected to one side by an obstacle on its right, and then impelled back again by an obstacle on its left, but as it has also an onward motion of its own, the result of these mutually influencing forces is a series of oscillations on either side of a central line. This is illustrated by a top spinning at an angle, or by a carriage swaying to and fro on an uneven road, which will not always upset, although its centre of gravity may be off the perpendicular. The bounding of a ball along a plain, or the surface of a lake, is also to the point. It is urged upward by the resistance of the water, it inclines downward from gravity, and it is impelled forward by its original momentum,—the result being a waving line of progress in a vertical plane, similar to what a river exhibits on a horizontal plane. I do not think these deflections and windings of rivers have ever been investigated analytically and reduced to formulæ, but their determination is of practical value, and I hope that a competent mathematician, like Mr. Pratt, may be inclined to give his attention to the subject.

The proper system of embanking obviously that proposed.—These characteristics of rivers being admitted as true, it is plain that the country generally should be protected by embankments formed on the verge of the belt of variation, and that lands within the belt should be protected by inferior embankments, over which an unusual flood may sweep, and so perhaps destroy them, but without reaching the summit of the main lines. It is not proposed to enter into the details of the construction of these dikes, which must vary according to soil, exposure, &c., but it is obvious that the smaller ones should always allow a moderate space, called a “free-way,” on either side of the channel for the time being, that neither set of embankments should form sharp angles, but rather bend the current by means of a rounded trace, and that for the same reason the inner sides of the “bunds” should slope gradually into the country or towards the river, although the outer faces may be as perpendicular as the nature of the soil will allow, or as circumstances may render convenient.

Embankments modify the tendency of rivers to raise their beds, and complicate the conditions rendering remote, but total changes of course

necessary.—The natural tendency of the double set of embankments, as indeed of all dikes, will be to cause the river to carry its alluvium farther and farther, and so gradually to raise both the bed of the immediate channel, and also of the general surface within the limits of the belt of variation. The belt will thus become higher above the neighbouring plains, and will also stretch farther into them, than would have been effected by nature alone. After a time there may be danger in retaining an immense flood above the level of the country, which without such embankments would at an earlier period have sought an escape to the right or left. The question will then arise, In what directions can the river be taken so as to cause the least sacrifice of property with the greatest prospect of a long continuance in the line chosen? Such a question has now in fact to be determined with respect to the Damooda, but it can only be properly discussed after the requisite data of levels, volume of water, &c. have been ascertained. The proposition sometimes made of abandoning the “bunds” of the Damooda seems unworthy of the science of the age, and if carried out would certainly cause a great destruction of property and lead to much personal distress among the poor.

On the Origin, Location, Numbers, Creed, Customs, Character and Condition of the Kócc, Bodo and Dhimál people, with a general description of the climate they dwell in. By B. H. HODGSON, Esq.

If we commence our researches into the aboriginal tongues and races of India in its north-east corner or Assam, we find that province rich in such materials for enquiry. But the majority of the numerous aborigines of the mountains of Assam, appear to belong to the monosyllabic-tongued or Chinese stem, with which we have nothing to do. A line drawn north and south across the Brahmapútrá, in the general direction of the Dhansri river, and continued southwards so as to leave Káchár within it or to the west of it, would seem not very inaccurately to divide the monosyllabic-tongued from the Tamulian mountaineers. Possibly, indeed, some of the hill tribes to the north of the Brahmapútrá, although within the Tamulian limits, as above conjecturally defined, may yet be

found to belong to the monosyllabic-tongued races ;* but to the south of that river, I think, it is pretty evident that such is not the case, for the Káchárians, Khasias and Gárós are, in creed, customs and languages, either identical with, or most closely affined to, the Bodo, while the Kúdi, Rábhá, and Hájong, if not rather nominal than real distinctions (Hajong, Hojai Kachari) are but branches of the great Bodo or Mécch family, whose proper habitat, be it remembered, is the plains and not the mountains. I should add, that it is a mistake to suppose the mass of the population in the *valley* of Assam to be of Arian race. I allude to the Dhékrás or common cultivators of the valley, who, as well as the Kácháris and Kócch of that valley, are Tamulians, as is proved beyond a doubt by their physical attributes, and in despite of that Bengálí disguise of speech and customs, which has misled superficial observers. The illustration of these Assamese races is, however, I believe, in better hands than mine ; and I therefore shall proceed for the present more westward. Whoso should advance from Góálpára in Assam to Aliganj in Morang would, in traversing a distance of some 150 miles along the skirts of the mountains of Bhútán† and Sikim, pass through the country of the following aborigines of Tamulian extraction : the Kócch, the Bodo, the Dhimál, the Rábhá, the Hájong, the Kúdi, the Batar or Bor, Kébrat, Pallah, Gangai, Maráha, and Dhanuk, not again to mention the Kachárians separately, they being demonstrably identical with the Bodo, and so in future to be regarded, nor further dwelling now on the Khasias and Garos than to observe that Buchanan notes them as parts of the population of Rangpúr in its old extent.‡ We may have more to say

* In the Northern Hills also the Dhansri seems to demark the Alpine races of Tibetan origin (ending easterly with the Lhopa or Bhutanese) from the Daphlas, Akas, Bors, Abors, Mishmis, Miris and others of apparently Chinese stock or Indo-Chinese, that is, monosyllabic.

† Bhútán recte Bhútánt, the end of Bhót, Sanskrit name of the country which the people themselves call Lhó, but like the Hindus, consider it an appendage of Bhot v. Tibet, of which the former is the Sanskrit and the latter the Persian designation. The native one is Bód.

‡ 15 in 60 words of Brown's Vocabulary, are the same in Gáró and in Mécch, and the whole 60 or nearly so in Kachári and Mécch. Again, the Kacháris called *themselves* Bodo, and so do the Mécch ; and lastly the Kachári deities Sijú, Mai-rong and Agráng are likewise Mécch deities—the chief ones too of both people to

of the rest of these tribes hereafter. Many of them have abandoned wholly their own tongues, and a deal of their own manners. But our present business is with the Kóech, Bodo and Dhimál, and first with the first.

Kóech Location.—In the northern part of Bengal, towards Dálimkót, appears to have been long located the most numerous and powerful people of Tamulian extraction on this side the Ganges, and the only one which, after the complete ascendancy of the Arians had been established, was able to retain or recover political power or possession of the open plains. What may have been the condition of the Kocch in the palmy days of Hinduism cannot now be ascertained : but it is certain that after the Moslem had taken the place of the Hindu suzerainty, this people became so important that Abul Fazl could state Bengal as being “ bounded on the north by the kingdom of Kocch which, he adds, includes Kamrup.” Hájó founded this kingdom towards the close of the fifteenth century, or beginning of the sixteenth, and it was retained by his sovereign successors for nearly 200 years.* In 1773 the Company’s gigantic power absorbed the Kocch Ráj, which once included the western half of Assam on one side and the eastern half of Mórung on the other, with all the intervening country, reaching east and west from the Dhansri river to the Konki, whilst north and south it stretched from Dálimkót to Ghóraghát. In other words the Kocch Ráj extended from 88° to 93½ east longitude, and from 25 to 27 north latitude, Kocch Bihar being its metropolis, and its limits being coequal with those of the famous yet obscure Kámrúp of the Tantras. Hájó’s representative still exercises jura regalia in that portion of the ancient possessions of the family which is called Nij Bihár, and he and the Jilpaigori and Pángá Rajas, together with the Bijni and Darang Rajas, and several of the Lords Marchers of the north frontier of Kámrúp (Barúas of the Dwárs)—all of the same lineage—still hold as Zamindar Rajas most of the lands between Sikim, Bhútán and Kámrúp, as at present constituted, and a southern line nearly coincident with the 26° of north latitude. Sukla Dev of the Kocch dynasty divided the kingdom, and there seems to have been in later times a triple Sultanat fixed at Bihar, Rangamati and Gauhati. The

whom I restore their proper name. These are abundant proofs of common origin of Garós also.

* Buch. Rangpur, Vol. III. p. 419, &c. &c.

Rajahs of Gauhati and their kinsmen of Darang extended the Kocch dominion eastward to and beyond the Májuli, or great Island of the Brahmapútrá. Hájó, the founder, having no sons, gave his daughter and heiress to a Bodo or Mécch chief in marriage; and to the wise policy indicated by this act (the policy of uniting the aborigines and directing their united force against intruders) was the founder of the Kocch dynasty, indebted for his success against the Moslems, the Bhútánesse and the Assamese.* Nevertheless the successors of Hájó speedily abandoned that policy, casting off the Mecch (Bodo) with scorn, and renouncing the very name of their own country and tribe, with their language, creed and customs, in favour of those of the Arians who, however resolutely they may eschew the aborigines, whilst continuing obscure and contumacious, never fail to hold out the hand of fellowship to them, when they become powerful at once and docile. In a word, Visva Sinh, the conqueror's grandson, with all the people of condition, apostatised to Hinduism: the country was renamed Bihár—the people, Rájbansi; so that none but the low and mean of this race could longer tolerate the very name of Kocch, and most of these, being refused a decent status under the Hindu regime, yet infected, like their betters, with the disposition to change, very wisely adopted Islám in preference to helot Hinduism. Thus the mass of the Kocch people became Mahomedans, and the higher grades, Hindus; both style themselves Ráj-bansi: a remnant only still endure the name of Kocch; and of these but a portion adheres to the language, creed and customs of their forefathers—as it were, merely to perpetuate a testimony against the apostasy of the rest! The above details are interesting for the light they throw upon the *character and genius of Hinduism*, which is certainly an exclusive system, but not inflexibly so; and whilst it readily admits the powerful to the eminent status of Rajpút vel Kshatriya, it is prone to tender to the humble and obscure no station above helotism—a narrowness of polity that enabled Buddhism not only to establish itself in the

* The Yogini Tantra denounces these three, under the appellations of Plov,* Yavan and Saumar, as the foreign scourges of the land. Buch. III. 413. The Assamese (Saumar) alluded to are the Ahoms, who held upper Assam when the Kocch held lower and middle, but with ever-varying limits.

* Pluh or Pruh is the Lepcha name of the Bhutanese, and may be the etymon of the Plava of the Tantras. The people of Bhutan call themselves Lhópá.

very metropolis of Hinduism (Bihar, Oude, Benares) but for 15 to 16 centuries* (sixth B. C. to eleventh A. D.) to contest with it the palm of superiority. The Yogini Tantra very properly denominates the Kocch, Mléccas or aborigines, the fact being imprinted in unquestionable characters on their non-arian physiognomy, and also on the language and customs of their unconverted brethren. They are called Kavach† in the Tantra just named, Hásá by the Kácháris or Bodos of Assam, Kamál by the Dhimáls, and Kocch by the Mecch or Bodos of the Méchi, as well as by themselves, where not perplexed with Brahmanical devises. Buchanan, who was furnished with every appliance for satisfactory research, and whose sagacity was not unworthy of his opportunities, estimated the numbers of the Kocch people twenty-five years ago, at 350,000 nearly. I am not aware that any good census has since been taken, and I have failed to obtain a general estimate: but from much inquiry, aided by Major Jenkins, Dr. Campbell and Permanand Acharj, I conclude that Buchanan missed a great many of them under the disguise of Islaám, that cultivation has vastly increased since his time, that the Kocch abound throughout the northern part of Rungpúr, Púrnea, Dinajpúr, Mymansing and in all Kamrup and Darang, as far as the Dhansri river, and that their numbers cannot be less than 800,000 souls—possibly even a million or million and quarter. In Assam they are divided into Kamthali and Madai or Shara, and Kolita or Kholta, and in Rungpúr, &c. into Rájbansi and Kocch—those of the Moslem faith every where dropping their ethnographic designation. Their first priests were Déóshi,‡ their next Kolita or Kholta, and their last, the Brahmans or Múllahs. Buchanan vouches that their primitive or proper language (as still used by the unadulterated remnant of the race) has no affinity with the Prákrits, and I can attest the entire conformity of the physiognomy of all,

* Sakya was probably born in 545 B. C. and died in 465, and that his creed was still flourishing in the eleventh century A. D. is proved by the then solemn repair of the great temple at Gaya. The persecution however was hot in the ninth.

† This is identical with Kócch, the difference being merely that of the Sanscrit and Prakrit forms of the same word.

‡ Observe that this is the name of the extant Bodo and Dhimál priesthood, one of numerous proofs demonstrative of the affinity of all the three people.

and of the creed and customs of this remnant with those of the other aborigines around them. I have already stated that I failed to get at the unconverted Kocch, and that my Vocabulary is that of the converted. Hereafter I trust to supply this desideratum, and in the meanwhile I cannot do better than give Buchanan's unusually careful and ample account of the condition, creed and customs of this people—which, being compared with my own subsequent statement of the condition, creed and customs of the Bodo and Dhimál (of whom Buchanan says little or nothing), will satisfactorily demonstrate the affinity I have insisted on.

Kócc̃h Status.—"The primitive or Páni Kocch live amid the woods, frequently changing their abode in order to cultivate lands enriched by a fallow. They cultivate entirely with the hoe, and more carefully than their (Arian) neighbours who use the plough, for they weed their crops, which the others do not. As they keep hogs and poultry they are better fed than the Hindus, and as they make a fermented liquor* from rice, their diet is more strengthening. The clothing of the Páni Kocch is made by the women, and is in general blue, dyed by themselves with their own indigo, the borders red dyed with Morinda. The material is cotton of their own growth, and they are better clothed than the mass of the Bengalese. Their huts are at least as good, nor are they raised on posts like the houses of the Indo-Chinese, at least, not generally so. Their only arms are spears: but they use iron shod implements of agriculture, which the Bengalese often do not. They eat swine, goats, sheep, deer, buffaloes, rhinoceros, fowls, and ducks—not beef—nor dogs, nor cats, nor frogs, nor snakes. They use tobacco and beer, but reject opium and hemp. They eat no tame animal without offering it to God (the gods), and consider that he who is least restrained is most exalted, allowing the Gárós to be their superiors, because the Gárós may eat beef. The men are so gallant as to have made over all property to the women, who in return are most industrious, weaving, spinning, brewing, planting, sowing, in a word, doing all work not above their strength. When a woman dies the family property goes to her daughters, and when a man marries he lives with his wife's mother, obeying her and his wife. Marriages are usually arranged by mothers in nonage, but

* The classic Zyth, ζυθον, beer without hops, as universal among the Aborigines in the absence of spirits or distilled waters.

consulting the destined bride. Grown up women may select a husband for themselves, and another, if the first die. A girl's marriage costs the mother 10 rupees—a boy's 5 rupees. This sum is expended in a feast with sacrifice, which completes the ceremony. Few remain unmarried, or live long. I saw no grey hairs. Girls, who are frail, can always marry their lover. Under such rule, polygamy, concubinage and adultery are not tolerated. The last subjects to a ruinous fine, which if not paid, the offender becomes a slave. No one can marry out of his own tribe. If he do, he is fined. Sutties are unknown, and widows always having property can pick out a new husband at discretion. The dead are kept two days, during which the family mourn, and the kindred and friends assemble and feast, dance and sing. The body is then burned by a river's side, and each person having bathed, returns to his usual occupation. A funeral costs 10 rupees, as several pigs must be sacrificed to the manes. This tribe has no letters; but a sort of priesthood called Déóshi, who marry and work like other people. Their office is not hereditary, and every body employs what Déóshi he pleases, but some one always assists at every sacrifice and gets a share. The Kocch sacrifice to the sun, moon and stars, to the gods of rivers, hills and woods, and every year, at harvest home, they offer fruits and a fowl to deceased parents, though they believe not in a future state. (?) The chief gods are Rishi and his wife Jágó. After the rains the whole tribe make a grand sacrifice to these gods, and occasionally also, in cases of distress. There are no images. The gods get the blood of sacrifices; their votaries, the meat. Disputes are settled among themselves by juries of Elders, the women being excluded here, however despotic at home. If a man incurs a fine, he cannot pay with purse, he must with person, becoming a bondman, on food and raiment only, unless his wife can and will redeem him.

Climate.—The climate of north Bengál or Kocch (including the country of the people so called, and of the Bodo and Dhimals) is too well known to require any particular notice. It is much less healthful than that of north Bihár, being infested with low-fevers, which are either propagated from the wilds north and east of it, or, more probably, generated on the spot by excessive moisture and vegetation in the very extensive tracts of waste, still unhappily to be found every where east of the Kósi river. West of that river, or in the ancient Mithila, and

modern north Bihár, the climate is as much more salubrious as cultivation is more diffused. The Saul forest every where, but especially to the east of the Kósi, is malarious to an extent which no human beings can endure, save the remarkable races, which for ages have made it their dwelling place. To all others, European or native, it is deadly from April to November. Yct the Dhimál, the Bodo, the Kíchak, the Thárú, the Dénwár, not only live but thrive in it, exhibiting no symptoms whatever of that dreadful stricken aspect of countenance and form which marks the victim of malaria. The like capacity to breathe malaria as though it were common air characterises nearly all the Tamulian aborigines of India, as the Kóls, the Bhíls, the Gónds, who are all fine and healthy races of men, though dwelling where no other human beings can exist. This single fact is to my mind demonstration that the Tamulians have tenanted the wilds they now dwell in for many centuries, probably, 30,* because a *very* great lapse of time could alone work so wonderful an effect upon the human frame, and even with the allowance of centuries, the fact stands forth as one of the miracles of human kind, which those who can explain may sneer at the *other* amazing diversities worked by time and clime on that marvellous unit, the seed of Adam! The Bodo and Dhimáls, whom I communicated with, alleged that they cannot endure the climate of the plains, where the heat gives them fevers. This is a mere excuse for their known aversion to quit the forest; for their eastern brethren dwell and till like natives in the open plains of Assam, just as the Kóls of south Bihár (Dhángars) do now in every part of the plains of Bihár and Bengal, in various sites abroad, and lastly in the lofty sub-Himálayas. The Kóls are, indeed, as enterprising, as industrious, and they should be employed by every European who seeks to reduce and cultivate any part of the malarious forests of India.† But, it must not be forgotten, that the very same qualities of freedom from disabling preju-

* There is "no cabalistic virtue" in 30, as Mr. Lyall observes in reference to his theory of the fourfold division of tertiary rocks. That number expressly is given, however, because about 3000 years back is the probable date of the emmigration of the Arian Hindus.

† How comes it that the Deyrah grantees, whom the malaria disables through their peasantry, do not procure Dhángars or Kóls, who would answer thoroughly and exactly for the purpose in view? I speak from much experience.

dicees, cheerful docility, and peaceable industrious habits and temper, which render the Kóls now so valuable to us, are the inherent characteristics of most of the aborigines, requiring only the hand and eye of a paternal Government to call them forth, as in the case of the Kóls. Ages of insolent oppression drove the aborigines to the wilds, and kept them there till their shyness of all strangers had become rooted and intense. But I can answer for the Bodo and Dhimál possessing every good quality of the Kóls, in an equal or superior degree, and the Bodo have already shown us with what facility those qualities may be put in action for our benefit as well as their own.

Physical type of all.—The physical type of the Koech, as contrasted with that of the Hindu, is palpable, but not so as compared with that of the Bodo and Dhimál. In other words, the physical type in *all* the Tamulians, (of this frontier at least) tends to oneness. A practised eye will distinguish at a glance between the Arian and Tamulian style of features and form—a practised pen will readily make the distinction felt—but to perceive and to make others perceive, by pen or pencil, the physical traits that separate each group or people of Arian or of Tamulian extraction from each other group, would be a task indeed! In the Arian form (Hindu) there is height, symmetry, lightness and flexibility: in the Arian face an oval contour with ample forehead and moderate jaws and mouth; a round chin, perpendicular with the forehead; a regular set of distinct and fine features; a well raised and unexpanded nose, with elliptic nares; a well sized and finely opened eye, running directly across the face; no want of eye-brow, eye-lash or beard; and lastly, a clear brunt complexion, often not darker than that of the most southern Europeans.

In the Tamulian form, on the contrary, there is less height, less symmetry, more dumpyiness and flesh: in the Tamulian face, a somewhat lozenge contour caused by the large cheek bones; less perpendicularity in the features to the front, occasioned not so much by defect of forehead or chin, as by excess of jaws and mouth; a larger proportion of face to head, and less roundness in the latter; a broader, flatter face, with features less symmetrical, but perhaps more expressive, at least of individuality; a shorter, wider nose, often clubbed at the end and furnished with round nostrils; eyes less, and less fully opened and less evenly crossing the face by their line of aperture; ears larger; lips

thicker; beard deficient; colour brunet as in the last, but darker on the whole and, as in it, very various. Such is the general description of the Indian Arians and Tamulians. With regard to the particular races of the latter, it can only be safely said, that the mountaineers exhibit the Mongolian type of mankind more distinctly than the lowlanders, and that they have, in general, a paler, yellower hue than the latter, among whom there are some (individuals at least) nearly as black as negroes. Among the Kóls* I have seen *many* Orauns and Múndas nearly black; whereas the Larkas or Hós (says Tickell) are as pale, and handsome too, as the highest caste Hindu? The Kóecch, Bodo and Dhimál are as fair as their Bengali neighbours on one side, and scarcely darker (especially the Bodo) than the mountaineers above them on the other side, and whom (the latter) they resemble in the style of their features and form, only with all the physiognomical characteristics softened down, and the frame less muscular and massive. The Kóls have a similar cast of face, and a very pleasant one it is to look upon in youth, exhibiting ordinarily far more of individuality, character and good humour than the more regular but tame and lifeless faces of the Arian Hindus.

Bodo and Dhimál Location.—I proceed now from the Kocch tribe to the Bodo and Dhimál tribes, who occupy the entire northern and eastern skirts of the Kocch country, between the open plains and the mountains, both of which sites, generally speaking, they avoid, and adhere to the great forest belt that divides the two, and which is, on an average, from 15 to 20 miles broad. The Dhimáls, who seem fast passing away as a separate race, and whose numbers do not now exceed 15,000 souls, are at present confined to that portion of the Saul forest, lying between the Konki and the Dhorla or Torsha, mixed with the Bodo, but in separate villages, and without intermarriage. But the Bodo are still a very numerous race, and extend, as foresters, from the Súrma to the Dhansri, and thence, viâ Bijni and the Bhútan and Sikim Tarai, to the Konki, besides occupying outside the forest limits, a large proportion of central and lower Assam. In the divisions of Darang and Chatgari they constitute the mass

* Kól is an old and classical name, and the best I think for the great mass of aborigines intervening between the Bhils, the Gonds, and the Ganges—at least till we know them better. The Orauns, Mundas, Kóls proper and Larkas, seem to be distinct, and the chief families or stirpes.

of the fixed population; they abound in Chárdwár and Noudwár: in Nougáon and Tularam's country, they are the most numerous tribe next to the Mikirs and Lalongs; in Kámráp next to the Dhékrá and Kocch; whilst in the marches or forest frontier of the *north*, from Bijni to Ali-ganj of Morung, they form the sole population, except the few Dhimáls, who are mixed with them; and in the *eastern* marches from Gauhati to Sylhet, they are less numerous only than the Gárós, Rábhás and Hájóugs, not to mention, that the two last, if not all three, are but Bodos in disguise. I look upon the Rábhá as merely the earliest and most complete converts to Hinduism, who have almost entirely abandoned the Bodo tongue and customs, and upon the Hájóugs or Hojáí Kacháris of Nowgong, as the next grade in time and degree of conversion, who now very generally affect a horror at being supposed confreres in speech or usages with the Bodo, though really such. Nor have I any doubt, that the Gárós are at least a most closely affiliated race, and no way connected with the monosyllabic-tongued tribes around them.* I do not, however, at present include the Gárós, or Rábhás or Hájóugs among the Bodo, who are now viewed as embracing only the Méches of the west and the Kácháris of the east and south; and, so limited, this race numbers not less than 150 to 200,000 souls. An accurate general census seems out of question except for Assam, but the above enumeration is given as an approximate result of several statements obligingly supplied to me by Mr. Kellner, Mr. Scott, Dr. Campbell, and that enlightened traveller Permanand Acharya. Thus the Bodo race extends from Tipperah and the country of the Kúkis on the south-east, to Morung and the country of the Kichaks to the north-west, circling round the valley of Assam by the *course of the Dhansri*, en route to the north, though Major Jenkins assures me that Bodos may be found even east of that river in the Assam valley. The latitude and longitude of the Bodo country are the same with those of the Kocch country, to speak without any affectation of a precision the subject does not admit of, and thus we may say the Bodo extend from 25 to 27 north latitude, and from 88 to 93½ east longitude; and that the Dhimáls are confined to the most westerly part of this wide range of country, or that portion lying between the Konki and the Dhorla. My

* See Note at page 703.

personal communications with these tribes were chiefly with those still found in all their primitive unsophistication on the banks of the Méchi, and from much intercourse with these, during four months, I conclude that neither people have any authentic ancient traditions. Nevertheless the ancient connexion of the Dhimáls with the west, and of the Bodo with the east part of north Bengal, is vouched by the facts, that a tract of country lying between the Konki and the Mahananda is still called Dhimáli; and a still larger tract situated between the great bend of the Brahmaputra and the Gáró hills is yet called Méchpárá. The close connection of the Bodo with Kámrúp, is further confirmed by the facts of the mass of the people being still found there, though under the name of Kachári, and by the intimate affinity of the Bodo speech and customs with those of the Gáros. The so-called Káchár Rajah is a new man and alien to the Bodo race, and so is the mass of the people of Káchár. But Túlárám is a Bodo; and the late Rajah of Karaibári another; and the Kalang-dwár chief a third; and among the Lords marchers of the southern confines of Assam, others might once, if not still, be found; for when the keeping of the northern marches (towards Bhutan) was entrusted to the Kóech race, that of the southern dwárs or doors (towards Gáró and Nágá land) was committed to the Bodo tribe, that is, to its chiefs. It would not appear that any chief of Dhimál race now exists: but the scattered remnant of this race assure me that they once had chiefs when they dwelt as a united people in Morung, on the banks of the Kaval (Kamlá) whence they removed to the Téngwá, and ultimately to and across the Konki, 60 years ago, in order to escape from Górkhalí oppression. Of the few lately extant chiefs of Bodo race, the Karaibári Rajah's estate is transferred to the stranger, and the Kalang and Túlárám chiefships are shorn of much of their "fair proportions." But in the days of Hájó, the Kóech founder, as well as in those of some of his more prudent successors, the Bodo seem to have had great political consequence, and if Hajos' descendants had steadily adhered to the wise maxims of their ancestor, their power might longer and more effectually have defied its enemies, whereas most of the Kóech Rajahs followed the illiberal Arian maxims of Viswa Sinh, and thus the Bodo were driven back upon their beloved forests, retreats which, speaking generally, neither they, nor the Dhimáls, have since quitted, save in Assam. I proceed now to the consideration of the

status, creed and customs of the Bodo and Dhimál. Upon these points the two people have so much in common that though I have myself gone through each particular separately in regard to each people, I shall spare the patience of my readers by aggregating what is common, and separating only what is particular, to the Bodo and Dhimál.

Satus—Condition.—The condition or status of the Bodo and Dhimál people is that of erratic cultivators of the wilds. For ages transcending memory or tradition, they have passed beyond the savage or hunter state, and the nomadic or herdsman's estate, and have advanced to the third or agricultural grade of social progress, but so as to indicate a not entirely broken connexion with the precedent condition of things; for, though cultivators, all and exclusively, they are nomadic cultivators, so little connected with any one spot that neither the Bodo nor Dhimál language possesses a name for village.* Though dwelling in those wilds, wherein the people of the plains (Ahirs and Gwallas) periodically graze immense numbers of buffaloes and cows, they have no large herds or flocks of their own, to induce them to wander; but, as agriculturists little versed in artificial renovative processes, they find in the exhaustion of the worked soil necessity, or in the high productiveness of the new, a temptation, to perpetual movement. They never cultivate the same field beyond the second year, or remain in the same village beyond the fourth to sixth year. After the lapse of 4 or 5 years they frequently return to their old fields and resume their cultivation, if in the interim the jungle has grown well, and they have not been anticipated by others, for there is no pretence of appropriation other than possessory, and if, therefore, another party have preceded them, or if the slow growth of the jungle give no sufficient promise of a good stratum of ashes for the land when cleared by fire, they move on to another site, new or old. If old, they resume the identical fields they tilled before, but never the old houses or site of the old village, that being deemed unlucky. In general, however, they prefer new land to old, and having still abundance of unbroken forest around them, they are in constant movement, more especially as, should they find a new

* *Arva in annos mutant et superest ager!* So immutable is human nature that the descriptions applied to our ancestors in their pristine state are absolutely and most significantly true of similarly circumstanced races now abiding in the forest jungles of India.

spot prove unfertile, they decamp after the first harvest is got in.* They are all in the condition of subjects (of Népál, Sikim, Bhútán or Britain) having no property whatever in the soil they till, and discharging their dues to the Government they live under (Sikim, for example) 1st, by the annual payment of one rupee per agricultural implement, for as much land as they can cultivate therewith, (there is no land measure ;) 2nd, by a corvée or tribute of labour for the sovereign and for his local representative. They calculate that they can raise 30 to 40 rupees worth of agricultural produce with one agricultural implement, so that the land tax is very light ; and the corvée is more irksome than oppressive. It requires them, on the Rajah's behalf, to quit their homes for 3 or 4 days, thrice a year, in order to carry burdens for him into the hills, whenever he has goods coming from the plains ; but, on the representative's behalf, to work only on the spot. Four times a year they must help to till his fields ; also to build or repair his dwelling-house ; to supply him with fuel and plates (leaves) whenever he gives a feast ; and, lastly, they must pay him one seer of cotton each year, for every cotton field they have. Very similar is the condition, in regard to taxation, of the Bodo and Dhimáls, under the Népál and Bhútán Governments. Under the British, the permanent cultivators of the open lands of Kámráp are subject to the usual burdens, incidental to our rule, which they discharge with ease, owing to their industrious and orderly habits. Major Jenkins gives them the highest character, observing that—"they are a remarkably fine peasantry and have very superior cultivation of the permanent kind." This is abundant proof of the docility of the Bodo, and strong presumptive evidence that their erratic habits and adhesion to the wilds, elsewhere, are the result of oppression, at least as much as of the bias of pristine custom. But, as the Kámrápian Bodo have abandoned with their erratic propensities, a deal of whatever is most characteristics of them as a distinct race, I resume the delineation of them and of the Dhimáls, as still found in primitive simplicity between Bijni and Mórang. There

* Such are the primitive habits, still in use from the Konki to the Monásh, and which are most worthy of study and record, as being primitive, and as being common to two people, the Bodo and Dhimál, though abandoned by the Kámrápian and most numerous branch of the Bodo.

they are migratory cultivators of a soil, in which they claim no sort of right, proprietary or possessory, but which they are allowed to till upon the easy terms of a quit-rent and labour tax, because none others will or can enter their malaria-guarded limits. There is no separate calling of herdsman or shepherd, or tradesman or shop-keeper, or manufacturer or handicraft, alien or native, in these primitive societies, which admit no strangers among them, though they live on perfectly amicable terms with their neighbours, and thus can always procure, by purchase or barter, the very few things which they require and do not produce themselves. To a person accustomed to the constitution of social bodies in India, whether Arian or Tamulian, it must seem nearly impossible, that communities could exist without smiths, and carpenters, and potters, and curriers, and weavers, not to mention barbers. Yet of these helot craftsmen, whose existence forms so striking a feature of all Indian societies, and whose origin and status so much need* illustration, there is no trace among the Bodo or Dhimáls, though they live apart from all others, like the Khónds, Gónds and Kóls, who *have* these aliens among them ; and necessarily so, for their inaccessible position and predacious propensities, would otherwise too often cut them off from all aid of craftsmen, whereas the Bodo and Dhimál, who dwell upon the plains, and on peaceful equitable terms with their neighbours, can always command such services, or rather their products in the markets. The Bodo and Dhimáls have no buffaloes, few cows, no sheep, a good many goats, abundance of swine and poultry, some pigeons and

* When we consider the indispensableness of the services of these craftsmen, it is remarkable that they should have continued to the present day, in a helot or out-caste state, not only among the Arians, but even among the Tamulians, not only in the plains but in the mountains. My belief is, that most of the Tamulians on the Arian conquest, retired to the mountains and jungles, and that those who remained were reduced to helotism and became the artizans of Arian society, such as we now see them. Ages afterwards some of them passed into the fastnesses and wilds occupied by their Tamulian brethren, in freedom, and fierce defiance, for the most part, of their Arian enemies. These immigrants are the recent helot craftsmen of the Gónds, Khónds and Kóls, such as we now see them ; Tamulians in origin like the masters they serve, but from whom they fail to obtain better treatment than from the Arians. No common tie is recognised ; and ages of freedom and of servitude have left no common trait of character.

ducks. They have no need, therefore, of separate herdsmen, unless it were swine herds, and these might be very useful in feeding their large store of pigs in the forest. But they have no such vocation among them, each family tending its own stock of animals, which is entirely consumed by that family, and no part thereof sold, though the proximate hill-men would gladly purchase pigs from them. But they love not trade nor barter further than is needful, and their need is confined to obtaining (besides rice) a few earthen and metallic culinary utensils, still fewer agricultural implements of iron, and some simple ornaments for their women—all which are readily obtained at the Kóech marts in exchange for the surplus cotton and oil seed of their efficient agriculture. Each man builds and furnishes his own house, makes the wooden implements he requires, and is his own barber, or his neighbour for him, and he for his neighbour. He uses no leather and he makes basketry for himself and family, whilst his wife spins, weaves and dyes the clothes of the family, and brews the beer which all members of it freely consume. Thus, all manufactures are domestic, and all arts. The Bodo and Dhimáls are generally averse from taking service with, or doing work for strangers, whether as soldiers, menials, or carriers, though there are a few soldiers and servants at Dorjiling belonging to the Bodo race, who conduct themselves well in their respective capacities. Among their own communities there are neither servants nor slaves, nor aliens of any kind; and whilst their circumstances tend to perpetuate equality of means, neither their traditions, their religion nor their usages sanction any artificial distinctions of rank. Though they have no idea of a common tie of blood, yet there are no diverse septs, clans or tribes, among them, nor yet any castes; so that all Bodo and all Dhimáls are equal—absolutely so in right or law—wonderfully so in fact. Nor is this equality the dead level of abject want. On the contrary, the Bodo and Dhimáls are exceedingly well-fed, and very comfortably clothed and housed, and so soon as you know them—for they are very shy of strangers—their voices, looks, and conduct all proclaim the absence of that grovelling fear, and cunning which so shock one in one's intercourse with the people of Bengal, and the mass of whom are much worse fed, and distinctly worse clothed and housed, than either Bodo or Dhimáls.

Laws.—It having been already stated, that these people are, and have been, for ages, in condition of subjects of foreign Govern-

ments, I need hardly observe that they have no *public laws* or polity, whatever, nor even any traces of that village economy which so pre-eminently distinguishes Indian-Arian societies. Their habits are too simple and migratory to allow of the existence of the village system, with its train of hereditary functionaries and craftsmen. They dwell in the forest in little communities, consisting of from 10 to 40 houses, which they are perpetually shifting from place to place. Each of these communities is, however, under a head called *Grà* by themselves, *Mondol* by their neighbours. To the foreign Government they live under their *Grà* is responsible for the revenue assessed which he pays periodically to the Rajah's representative—the *Choudri*—in cowries or rupees, the only currency. He has no scribe, nor keeps any accounts, his simple explanations to the *Choudri* being verbal. To the *Choudri* he is answerable, likewise, for the keeping of the peace and for the arrest of criminals : but crimes of a deeper dye are almost unknown, and breaches of the peace, very rare. Should a murder or robbery occur the *Choudri* would take cognizance of it, assisted by 3 or 4 proximate heads and elders of villages, and report to the Rajah, from whom alone in such cases, a decision could issue. With regard to his own community, the head of the village has a general authority of voluntary rather than coercive origin ; and which, in cases of the least perplexity is shared with the heads or elders of two or three neighbouring villages. Those who offend against the customs of the Bodo or *Dhimál*, that is, their own customs, are admonished, fined, or excommunicated, according to the degree of the offence, the village priest being called in, perchance, to give a higher sanction to the award. The same Jury-like tribunal, seems to have almost exclusive cognizance of *civil law*, or the usages of each people in regard to inheritance, adoption, divorce, &c. Marriage is rather a contract than a rite, and, as such, is dissoluble at the will of either party ; and if the divorce be occasioned by the wife's infidelity, the price paid for her to her parents, must be refunded by them. Dower is not in use, and women, in general, are deemed incapable of holding or transmitting property. All the sons get equal shares, nor is there any nice distinction of sons by marriage, adoption or concubinage. Adoption is common and creditable, even if there be one son of wedlock : concubinage is rare and discreditable. Daughters have no inheritance nor dower : but if their parents be rich

and give them marriage presents, such are held to be their own, and will be retained by them in the event of divorce. Neither Bodo nor Dhimal can marry beyond the limits of his own people, and if he do, he is severely fined. Within those limits only, two or three of the closest natural ties are deemed a bar to marriage. In the event of divorce, the children belong to the father or the sons to the father, and the daughters to the mother. If the husband take the adulterer in the fact, he may beat him and likewise the wife; but no more;* and thereafter, if he please, he may put his wife away, when she and the adulterer will continue to abide together as man and wife, without scandal, but without marriage rite; or, if the husband please, he may pardon her and frequently does so, should the offence have been the first, and committed with one of the tribe and not with an alien. Chastity is prized in man and woman, married and unmarried; and, as a necessary consequence, women are esteemed and respected, and divorce and separation rare, notwithstanding the bad footing upon which the custom or law of these nations sets the nuptial union. Syphilis is absolutely unknown among the Bodo and Dhimal,—a fact that speaks volumes, and one that renders it scarcely necessary to add, that any class of women, devoted to unchastity, is a thing for which their languages have no name, and their manners, no place. Filial piety is not a marked feature in their character, nor perhaps the want of it. Sons, on marriage, quit the parental roof, and sometimes, previously: but it is deemed shameful to leave old parents entirely alone, and the last of the sons, who by his departure, does so, is liable to fine as well as disinheritance. Infanticide is utterly unknown, with every savage rite allied to it, such as human sacrifice, self-immolation and others, too frequent among rude people. Daughters, on the contrary, are cherished, and deemed a source of wealth, not poverty, for every man must buy his wife with coin or labour, and 'tis very seldom that the price comes to be redemanded by the wronged and unforgiving husband. There is no bar to re-marriage, and satti is a rite held in abhorrence.

Learning.—*Of learning and letters*, the Bodo and Dhimals are totally devoid, and always have been so. The numerals of the cardinal scale

* Among the Parbettias of Nepal the wronged husband may, nay must, slay the adulterer.

are only seven in the Bodo tongue, ten in the Dhimáls, and they have no ordinals at all. Beyond 7 or 10 they count by the Hindu ways of fours and of scores, and in this manner they can reckon to 200. Very few of the Bodo or Dhimáls have learnt to write the neighbouring Prá-krits, but many can converse in them, particularly in the corrupt Bengálí prevailing from the Kosi to the Brahmapútra. To the segregated manner of life of the Bodo and Dhimáls, and to the practice of both people of marrying only within the pale of their own folk, I ascribe the present purity of their languages.

Religion.—The religion of the Bodo and Dhimáls, is distinguished, like their manners and customs, by the absence of every thing that is shocking, ridiculous, or incommodious. It lends no sanction to barbarous rites, nor does it hamper the commerce of life with tedious insane ceremonial observances. It takes less cognizance than it might advantageously do of those great sacraments of humanity, baptism, marriage, and sepulture, withholding all sanction from the first, and lending to the other two, especially marriage, a less *decided* sanction than the interest of society demand. The deplorable impediments to the business of society, occasioned by the Hindu (Arian) religion, are too well known to call for specification. But even some of the Tamulians are pestered with usages under the guise of religion, which are alike injurious to health and convenience,* or are pregnant with cruelty.† From all such crimes and mischiefs the religion of the Bodo and Dhimáls is wholly free. With the most striking events or dearest ties of life it meddles little directly, confining itself almost exclusively to the propitiation of the superior powers by offerings and sacrifices. A Bodo or Dhimál is born, is named, is weaned, is invested with the toga virilis, without any intervention of his priest, who is summoned to marriages and funerals chiefly, if not solely, to perform the preliminary sacrifice, which is indispensable to consecrate a feast, for no Bodo or Dhimál will touch flesh, the blood of which has not been offered to the gods; and, flesh constitutes a goodly proportion of the material of those feasts which solemnise funerals and weddings alike.

† Khasias. Robinson's Assam, p. 413 and Buchanan's Reports, vol. III. p.

‡ Gárós. Elliott. Asiatic Researches, III. 29. Khóns. Marpherson's Reports and Taylor's Account, vide Madras Journal, No. 16, and Calcutta Review, No. IX.

Priesthood.—The office of the priesthood is not an indefeasible right vested in a caste, nor is the profession at all exclusive. The priests are native Bodo or Dhimál, no way distinguished from the rest of the community, either before or after induction. Occasionally the son will succeed the father in this office, but rarely; and whoever chooses to qualify himself, may become a priest, and may give up the profession whenever he sees fit. More than this, the Elders of the people may and do participate in the functions of the priesthood, and even exercise them alone, so that it is not improbable there was a time when the civil heads of the community were likewise its ecclesiastical directors. This imperfect constitution of the clerical office has, probably, proved upon the whole a great blessing to these people by saving them from the trammels of *all* refined Paganism, (Egyptian, Classic, Indian,) though it has had the necessary ill effect of keeping their religious ideas in a state of extreme vagueness. I am not inclined to consider “the natural man” as a savage; and I have no hesitation in calling the religion of the amiable Bodo and Dhimáls, the religion of Nature, or rather, the natural religion of man. It consists, clearly enough, of the worship of the most striking and influential of sensible objects—of the “starry host,” and of the terrene elements—with a vague but impressive reference of the *powers* displayed by these sensible objects to an immaterial or moral source, unknown indeed, but still adored as Divine, and even as a divine Unity.* It is true that these latter conceptions are too vague to be denominated, strictly speaking, ideas, proper to these people, much less positive tenets of their creed; and hence their languages have no word for God, for soul, for heaven, for hell, for sin, for piety, for prayer, for repentance. It is true that their gods are many, and are all void of definite moral attributes (save when their own meaner passions of vanity and anger and grief are occasionally ascribed to them). But still, in the pre-eminence assigned, however vaguely, to one (or two) of these gods, we cannot deny to these simple-minded races the germ of a *feeling* of God’s unity; and when they appeal to Him as the avenger of perjury, the sanctioner of an oath—we must acknowledge that the moral senti-

* I refer the caviller to Pope’s universal prayer, and to that famous fane of antiquity dedicated to the unknown God.

ments of their own nature irresistibly impel them to ascribe like sentiments to the godhead. Now, in every serious matter of dispute that cannot be decided by testimony, usually so called, oaths and ordeals are had recourse to—and both, as substitutes for, and confirmatives of, evidence, according to the ancient Jewish (nay, universal) notions on this head. But oaths and ordeals are appeals to the moral nature of the Divinity: nor can it be denied that, though the practical religion of the Bodo and Dhimáls consists of idle offerings and sacrifices to trivial deities, yet that supplications for protection from danger, and thanksgivings, when it is over, accompany these offerings and these sacrifices, forming a part, how inconsiderable soever, of the religious rights of the people as conducted by the priesthood. The priests, or the elders, superintend the administration of oaths and of ordeals: the priests *alone* direct and conduct those high festivals, which thrice a year are celebrated in honour of the Elemental gods, and once a year in honour of the household divinities; as likewise those occasional acts of worship, which originate with more or less diffused, or individual, calamity. The calamities to which the Bodo and Dhimál stand most exposed, are small-pox and cholera, which sorely afflict them; and drought, blight, and the ravages of wild elephants and rhinoceroses, from which their crops suffer not less. Diseases are considered to arise entirely from preternatural agency, and hence there are no medical men, but a regular class of exorcists, who are a branch of the priesthood, and whose mode of relieving the possessed or sick will be described presently. They are called Ojhá, and are the sole physicians. Small-pox is the direst scourge of the Bodo and Dhimáls; next cholera (since 1818); next itch; then diseases of the intestines, as diarrhœa and dysentery; then fever; then goitre; diseases of the liver and lungs are very rare; and syphilis is unknown. The Bodo and Dhimál, though healthy races, are not long-lived nor prolific. Grey hairs are less common than in the hills or plains: 60 is deemed a great age: a family of 8 or 9 living children is hardly known: 5 or 6 alive is nearly the maximum; and 2 to 4 the mean. The hazards and the importance of agriculture to the Bodo and Dhimál, are sufficiently indicated by their creed, the three chief festivals of which have almost exclusive reference thereto. Great as are the ravages committed on the crops by insects and wild animals, drought seems to be dreaded still more than either, so that among all

the numerous gods Jupiter Pluvius, as typed by the rivers, commands a reverence, second to none with the Dhimáls, second to one or two only with the Bodo. *All* the rivers between the Cosi and the Torsha are chief divinities of the Dhimáls—all those between the Konki and the Bar nadi, prime deities of the Bodo. Fire, however, indispensable agriculturally for the clearing of the forest, is by no means equally revered; nor the earth, which yields all; nor the noble forest, so cherished and so many ways indispensable; nor the mountains whence come these very rivers; nor even the sun and moon, which alone of the starry hosts are worshipped at all. All these deities are worshipped devoutly indeed, but none with such earnestness as the rivers: and yet the rivers flow too low to allow of their waters being turned to irrigation, so that it is as an index of copious rains, upon which exclusively Bodo and Dhimál crops are dependant, that the rivers are entitled to this reverence, though crossing as they do so frequently and so directly the route of communication through the country of these tribes, 'tis no wonder that they have unusually commanded attention. When I first obtained lists of the Bodo and Dhimál divinities, at once so numerous and so devoid of attributes, I was exceedingly perplexed what to make of these gods, how to render them at all intelligible to myself or others. But one key to the enigma was soon found in the Hindu pantheon—another in the best frontier maps, especially those of Rennell, where the rivers proved to be so many *Dii majores*. A third class of gods, and a very important and characteristic one, in regard to the Bodo more particularly, remained, however, for solution. These following the people themselves, I have denominated the 'household gods,' because their worship is conducted *inter parietes*. 'National,' however, were the fitter term, for these are the original deities of the whole people, and though their worship be conducted at home, or in each house, the whole neighbourhood participates through the medium of the accompanying sacrifice and feast, and reciprocally at every householder's of the village, once a year in solemn pomp, and more frequently and quietly as occasion may require. Not to mention that these deities likewise share with the elemental gods the high triennial festivals above adverted to; for how ample soever the Bodo or Dhimál pantheon, their practical religion is as simple as their manners, and they dispose of their superfluous divinities by adoring them all in

the lump! A good many of the household or national divinities of the Bodo are elemental gods, chiefly rivers. Báthó, however, the chief god of the Bodo, is not an elemental god: but he is clearly and indisputably identifiable with *something tangible*, viz. the Sij or Euphorbia; though why that useless and even exotic plant should have been thus selected to type the godhead, I have failed to ascertain. Mainou or Mainong is the wife of Báthó, and equally revered with him: more I cannot learn of her. The supreme gods of the Dhimáls are usually termed Waráng-Béráng, that is, the old ones, or father and mother of the gods. They likewise are a wedded pair, whose proper names are, respectively, Pochima and Timai vel Timáng, of whom the latter is undoubtedly the Tishta river; and the former, I believe, the river Dhorla. The Bodo and Dhimáls have neither temple nor idol; and altogether their religion belongs to the same primitive era with their habits and manners, is void of offence or scandal, and if any judgment may be made of it from the manners and character of its professors, is not without beneficial influences.

I proceed now to some details upon this point, in which it will be necessary sometimes to speak separately, of the Bodo and Dhimál religions, though so little essentially distinct. This general correspondence extends not merely to the entire substance and character of the religion, properly so called, of each people, but to all minor points connected therewith; for example, both people have but a vague notion of the existence or functions of those *Dii minores* called Genii, Fauns, Satyrs and Sylvens by the classic ancients, and Fairies, Sprites, Gnomes, Ogres, &c. by our Gothic or Teutonic ancestors. Neither people is infested with the Gothic bugbear of ghosts, or with the Gothic and classic follies of magic, sorcery, divining, omens, auspices, astrology or fortune-telling. On the other hand, both Bodo and Dhimál alike and devoutly believe in witchcraft, of which they entertain a deep dread, and likewise in the influence of the evil eye, though much less dreaded than witchcraft. Omens are very slightly, if at all, heeded by either.

Pantheon.—The chief deities of the*Bodo*

and

Dhimáls.

Báthó, chief god. Euphorbia or Sij plant.	The household or National gods, or Noöni Madai.	}	Pochima, mas. father of the gods, the river Dhorla ?
Mainou or } wife of the			Timai vel } fœm. mother of the
Báthó Búrói, } above.			Timang, } gods : the Tishta
Agráng, male, relative of the above pair.			river.
Khárgi, male.			Lákhim, fœm. sister of Timai with some : Mahanada ?
Ablákhúngar, male.			Chímá, fœm. sister of Timai : the Kosi river.
Khoílá, male, river ?			Konokchiri, fœm. feeder of Konki river.
Manáshó, female. River Mo- nás or Bonás.			Kangkai, fœm. river Konki.
Bráí, male, river ? styled Brai or the ancient.			Ménchi, fœm. river Mechi.
Búli, female, river ? styled the ancient or Búroi.			Sonási, mas. the Soran river.
Khandaira, male, a Rajah.			Bonási, mas. the Boás or Doás.
Jaman, male, Yama of Hin- dus.			Dhúlpi, mas. the Dúbélly river.
Kóngar or } male, Bhutanese			Danto, mas. styled the old.
Góngar, } Deity.			Chádúng, mas. styled Rajah, son of Timai.
Jishing, } males.			Aphoi, mas. Rajah, son of Timai.
Mishing, } males.			Biphoi, ditto ditto ditto.
Dhórlabrai, mas. river, hus- band of Tishta.	Aphún, ditto ditto ditto.		
Dúdkosi, female, river.	Káphún, ditto ditto ditto.		
Tishta, ditto, ditto.	Báphún, ditto ditto ditto.		
Kangkai, ditto, ditto.	Shúti, ditto ditto ditto.		
Ménchi, male, river.	Rong, mas.		
Torsha, ditto, ditto.	Aika, mas. et fœm. styled the old.		
Jórdaga, ditto, ditto : the Jer- deckér R.	Tairúng, } males, sons of Biphoi.		
Bálakhúngar, ditto ditto : the Bálásan.	Túirúng, }		
Máhámáyá, female. River	Hili mahadóí, } Females all ;		
Mahananda.	Khúñchi mahadóí, } wives of the		
Doímá, Brámaputra. fœm.	Khili mahadóí, } 7 sons of Ti-		
Mater magna.	Airi mahadóí, } mai above		
Chádúng.	Birti mahadóí, } given. Ap-		
Gédúng.	Nílo mahadóí, } parently Hin-		
Brai Bhandári.	Kálo mahadóí, } du Deities,		
Jholou Bhandári.	newly named, or rather renam- ed by the Dhimáls.		
Káthá, male, a Raja.	Béla, mas. the Sun.		
Dipkhúngar.	Táli, fem. the Moon.		
Phorou khúngar.	Bhanói, fœm. the Earth.		
Shyánmadai, the sun,	Singko Dír, the forest gods.		
Nokhábírmadai, the moon.	Ráko Dír, the mountain gods.		
	Chambochiri, fœm. the Champa- mati river.		
	Dávai chiri, fœm. river ?		
	Phúl chiri, ditto ditto.		

Raj phúsarí,		Male, a Penate.
Agráng kólia,		Agrang of prior list.
Khandab,		Fluviatile deities, malignant. Pi-
Jol khúnjara,	}	geons sacrificed to them.
Jol khúnjari,		
Áyá, or Ai,*	} Adopted Hin- dú gods.	
Maknar,		Kámakhya.
Jomon,		Lakshmi.
Jal kúvır,		Yama.
Thal kúvır,		} Kúvır, Indian Pluto.
Dhon kúvır,		

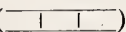
I know not that I can add any thing worth preserving to the foregone list of the deities of the Bodo and Dhimál save what will fall more appropriately under the head of rites and ceremonies. The list might have been considerably enlarged, but chiefly by importations from the Hindu Pantheon; and as these consist of mere names, it seems sufficient to observe, once for all, that the Bodo and Dhimál have latterly adopted a good many of the Hindu goddesses, particularly the various forms of Durga or Kali, but without any of the rites appropriate to her worship, or even any images of her. The deities of the Bodo and Dhimál are divided into males and females, old and young; and the latter distinction is material as indicating the relative rank and consideration of the gods: the ancient or venerable (Brai-Baroï in Bodo, Warang-Bérang in Dhimál, according to the sex) are the Dii majores; the young (Khungar vel Jholou in Bodo, Whante in Dhimál), are the Dii minores. It will be noticed that several of the deities bear the title of Rajah; and, as one of these (Hájó) is a known historic person, it seems probable that this portion of the Bodo and Dhimál pantheon exemplifies the classic and Hindu practice of deifying the mortal benefactors of mankind—in a word, apotheosis, or hero worship. Madai, in Bodo, is a general term, equivalent to Deity, Divinity: Dír and Grám, are correspondent terms in Dhimál.

Religious rites and ceremonies.—The rites of the Bodo and Dhimál religions are entirely similar, and consist of offerings, sacrifices and prayers. The prayers are few and simple, when stripped of their mumery; and necessarily so, being committed solely to the memories of a non-hereditary and very trivially instructed and mutable priesthood. They consist of invocations of protection for the people and their

* Unde Ai húnó, the great festival, presently to be described.

crops and domestic animals ; of deprecations of wrath when sickness, murrain, drought, blight, or the ravages of wild animals, prevail ; and thanksgivings when the crops are safely housed, or recent troubles are passed. The offerings consist of milk, honey, parched rice, eggs, flowers, fruits, and red lead or cochineal : the sacrifices of hogs, goats, fowls, ducks, and pigeons—most commonly hogs and fowls. Sacrifices are deemed more worthy than offerings, so that all the higher deities, without reference to their supposed benevolence or malevolence of nature, receive sacrifices—all the lesser deities, offerings only. Libations of fermented liquor always accompany sacrifice—*because*, to confess the whole truth, sacrifice and feast are commutable words, and feasts need to be crowned by copious potations. Malevolence appears to be attributed to very few of the gods, though of course all will resent neglect ; but, in general, their natures are deemed benevolent ; and hence the absence of all savage or cruel rites. All diseases, however, are ascribed to supernatural agency. The sick man is supposed to be possessed by one of the deities, who racks him with pains as a punishment for impiety or neglect of the god in question. Hence, not the mediciner, but the exorcist is summoned to the sick-man's aid. The exorcist is called both by the Bodo and Dhimáls Ojhá, and he operates as follows. Thirteen leaves each with a few grains of rice upon it, are placed by the exorcist in a segment of a circle before him to represent the deities. The Ojhá, squatting on his hams before the leaves, causes a pendulum attached to his thumb by a string to vibrate before them, repeating invocations the while. The god who has possessed the sick man, is indicated by the exclusive vibration of the pendulum towards his representative leaf, which is then taken apart, and the god in question is asked, what sacrifice he requires ? a buffalo, a hog, a fowl, or a duck to spare the sufferer. He answers (the Ojhá best knows how !) a hog ; and it is forthwith vowed by the sick man and promised by the exorcist, but only paid when the former has recovered. On recovery the animal is sacrificed, and its blood offered to the offended deity. I witnessed this ceremony myself among the Dhimáls, on which occasion the thirteen deities invoked were Póchima or Waráng, Timai or Béráng, Lákhim, Konoksiri, Méchi, Chímá, Danto, Chádúng, Aphóí, Biphóí, Andhéman (Aphún), Tátópátia (Báphún) and Shúti. A Bodo exorcist would proceed precisely

in the same manner, the only difference in the ceremony being the invocation of the Bodo gods instead of the Dhimal ones.

Festivals.—The *great festivals* of the year are three or four. The first is held in December-January, when the cotton crop is ready. It is called Shúrkhar by the Bodo, Haréjata by the Dhimals. The second is held in February-March. It is named Wágálénó by the Bodo, who alone observe it. The Bodo name for the third, which is celebrated in July-August, when the rice comes into ear, is Phúlthépno. The Dhimals call it Gávi púja. The fourth great festival is held in October, and is named Aihúnó by the Bodo—Pochima páká by the Dhimals. The three first of these festivals are consecrated to the elemental gods and to the interests of agriculture. They are celebrated abroad, not at home, (generally on the banks of a river) whence attendance on them is call Hogron húdong, or madai húdong, ‘going forth to worship,’ in contradistinction to the style of the 4th great festival, which is devoted to the household gods, and is celebrated at home. The Wágálénó or bamboo festival of the Bodo I witnessed a year or two since, and will describe it is a sample of the whole. Proceeding from Siligori to Pankhabári with Dr. Campbell, we came upon a party of Bodo in the bed of the river, within the Saul forest, or rather, were drawn off the road by the noise they made. It was a sort of chorus of a few syllables, solemnly and musically incanted, which, on reaching the spot, was found to be uttered by thirteen Bodo men, who were drawn up in a circle facing inwards, and each carrying a lofty bamboo pole decked with several tiers of wearing apparel, and crowned with a Chour or Yak’s tail. Within the circle were three men, one of whom, with an instrument like this () in his hands danced to the music, waving his weapon downwards on one side, so over the head, and then downwards on the other side and again over the head. He moved round the margin of the circle, in the centre of which stood two others, one a Deóshi, or priest, and the other an attendant or servitor, called Phantwál. The priest, clothed in red cotton, but not tonsured or otherwise distinguished from the rest of the party, muttered an invocation, whereof the burden or chorus was taken up by the thirteen forming the ring above noticed. The servitor had a water pot in one hand and a brush in the other, and from time to time, as the rite proceeded, this person moved out of the circle to sprinkle with

the holy water another actor in this strange ceremony, and a principal one too. This is the Déódá, or the possessed, who when filled with the god, answers by inspiration to the questions of the priest as to the prospects of the coming season. When we first discerned him, he was sitting on the ground panting and rolling his eyes so significantly that I at once conjectured his function. Shortly afterwards, the rite still proceeding, the Déódá got up, entered the circle and commenced dancing with the rest, but more wildly. He held a short staff in his hand, with which, from time to time he struck the bedizened poles, one by one, and lowering it as he struck. The chief dancer with the odd-shaped instrument, waxed more and more vehement in his dance; the inspired grew more and more maniacal; the music more and more rapid; the incantation more and more solemn and earnest; till at last amid a general lowering of the heads of the decked bamboo poles, so that they met and formed a canopy over him, the Déódá went off in an affected fit, and the ceremony closed without any revelation—a circumstance which must be ascribed to the presence of the sceptical strangers; for it is faith alone that worketh miracles, and only among and for the faithful. This ceremony is performed annually by the Rajah of Sikim's orders, or rather with his sanction of the usages of his subjects; is addressed to the sun, the moon, the elemental gods, and above all, to the rivers; and is designed to ensure health and plenty in the coming year, as well as to ascertain beforehand, its promise or prospect through the revelations of the Déódá. With regard to the festival sacred to the national or homebred (noöni) gods, called Aihuno by the Bodo and Póchima páká by the Dhimáls, it is to be observed that the rite, like the separate class of deities adored thereby, is more distinctively Bodo than Dhimál. With both people the pre-eminence of water among the elements is conspicuous: but, whereas the river gods of the Dhimáls have nearly absorbed all the rest, elementary or other, the household gods of the Bodo stand conspicuously distinguished from the fluviatile deities. The Prochima and Timang of the Dhimals are one or both rivers: the Báthó and Mainang of the Bodo are neither of them rivers, and their interparietal rites are as clearly distinguished from the rites performed abroad to the fluviatile and other elemental gods. However, the rites of Báthó and Mainou are *participated* by deities of elementary and watery nature, and, on the other hand, the Dhimáls assert

that Póehima and Timai have a two-fold character, one of river gods (Dhorla and Tishta), and one of supreme gods; and that they are adored, separately, in these two characters, the Póehima páká or home rite of October, being appropriated to them in the latter capacity, or that of supreme gods. I have not witnessed the Póehima páká, and therefore speak with hesitation. The Ai húnó* is performed as follows. The friends and family being assembled, including as many persons as the master of the house can afford to feast, the Déóshi or priest enters the enclosure or yard of the house, in the centre of which is invariably planted a Sij or Euphorbia, as the representative of Báthó, who is the family as well as national god of the Bodo. To Báthó thus represented the Déóshi offers prayers, and sacrifices a cock. He then proceeds into the house, adores Mainou and sacrifices to her a hog. Next, the priest, the family and all the friends proceed to some convenient and pleasant spot in the vicinity, previously selected, and at which a little temporary shed has been erected as an altar, and there, with due ceremonies, another hog is sacrificed to Agráng, a he-goat to Manásho and to Búli, and a fowl, duck or pigeon (black, red, or white, according to the special and well known taste of each god) to each of the remaining nine of the Noöni madai. The blood of the sacrifice belongs to the gods—the flesh to his worshippers, and these now hold a high feast, at which beer and tobacco are freely used to animate the joyous conclave, but not spirits nor opium, nor hemp. The goddess Mainou is represented in the interior of each house by a bamboo post about 3 feet high, fixed in the ground, and surmounted by a small earthen eup filled with rice. Before this symbol is the great annual sacrifice of the hog above noted, performed; and before this, the females of the family, *once a month*, make offerings of eggs. For the males, due attention to the four annual festivals is deemed sufficient in prosperous and healthful seasons. But sickness or scarcity always beget special rites and ceremonies, suited to the circumstances of the calamity, and addressed more particularly to the elemental gods, if the calamity be drought or blight or devastations of wild animals—to the household gods, if it be sickness. Hunters, likewise, and fishers, when they go forth to the chase, sacrifice a fowl to the Sylvan gods, to promote their success; and lastly, those who have a

* Ai or Aya, is the goddess Kámákyá or Kámrúp, vis genetrix naturæ, typed by the Bhaga or Yoni.

petition to prefer to their superiors, conceive that a similar propitiation of Jishim and Mishim, or of the Chiris, will tend to the fulfilment of their requests. And this, I think, is nearly the whole amount of rites and ceremonies which their religion prescribes to the Bodo and Dhimáls. And anxious as I am fully to illustrate the topic, I will not try the patience of my readers by describing all that variety of black victims and white, of red victims and blue, which each particular deity is alleged to prefer; first, because the subject is intrinsically trifling; and second, because the diverse statements of my informants lead me to suspect that the matter is optional or discretionary with each individual priest prescribing these minutiae. I have mentioned the rude symbols proper to Báthó and Mainou. None of the other gods seem to have any at all, though a low line of kneaded clay attached to the Tháli that surrounds the sacred Euphorbia in the yards of the Bodo is said to stand for the rest of the divinities, who, as I have already said, are wont to be worshipped collectively rather than individually; and thus the sun, the moon and the earth, though adored by Bodo and by Dhimál, have no separate rites, but are included in those appropriated to the elemental gods. Witchcraft is universally dreaded by both Bodo and Dhimál. Witches (Dain and Mháí) are supposed to owe their noxious power to their own wicked studies, *or* to the aid of preternatural beings. When any person is afflicted, the elders assemble and summon three Ojhás or exorcists, with whose aid and that of a cane freely used, the elders endeavour to extort from the witch a confession of the fact and the motives. By dint of questioning and of beating the witch is generally brought to confession, when he or she is asked to remove the spell, to heal the sufferer, means of propitiating preternatural allies (if their agency be alleged) being at the same time tendered to the witch, who is, however, forthwith expelled the district and put across the next river, with the concurrence of the local authorities. No other sorcery or black art save that of witches is known; nor palmistry, augury, astrology, nor, in a word, any other supposed command of the future than that described in the 'Wá galéno' as the attribute, (for the nonce) of the Déódá or vates. The evil eye cause some alarm to Bodo and to Dhimál, who call it mogon nángo and mínójó respectively, and who cautiously avoid the evil-eyed person, but cannot eject him from the

community. The influence of the evil-eye is sought to be neutralised by offerings of parched millet and eggs to Khoja Kajah and Mansha Rajah—Dii minores, who find no place in my catalogue, ample as it is. Moïsh madai, I am told, likewise claims a place in the Bodo Pantheon, and a distinguished place too, as the protector of this forest-dwelling people, from beasts of prey, and especially the tiger.

Priesthood.—The priesthood of the Bodo and Dhimáls is entirely the same, even to the nomenclature, which with both people expresses the three sorts of clergy by the terms Déóshi, Dhámi and Ojha. The Dhámi (seniores priores!) is the district priest. The Déóshi, the village priest, and the Ojha, the village exorcist. The Déóshi has under him one servitor called Phantwál. There is a Déóshi in nearly every village. Over a small circle of villages one Dhámi presides and possesses a vaguely defined but universally recognised control over the Déóshis of his district. The general constitution and functions of the clerical body have already been fully explained. Priests are subject to no peculiar restraints, nor marked by any external sign of diverse dress or other. The connexion between pastor and flock is full of liberty for the latter, who collectively can eject their priest if they disapprove of him, or individually can desert him for another if they please. He marries and cultivates like his flock, and all that he can claim from them for his services is, first, a share of every animal sacrificed by him, and second, three days' help from each of his flock (the grown males), per annum towards the clearing and cultivation of the land he holds on the same terms with them, and which have been already explained. Whoever thinks fit to learn the forms of offering, sacrifice and accompanying invocation, can be a priest; and if he get tired of the profession, he can throw it up when he will. Ojhás stand not on the same footing with Dhámis and Déóshis: they are remunerated solely by fees: but into either office—priests or exorcists—the form of induction is similar, consisting merely of an introduction by the priests or exorcists of the neophyte to the gods, the first time he officiates. One Dhámi and two Déóshis usually induct a Déóshi—three Ojhás, an Ojhá: and the formula is literally that of an introduction—‘this is so and so, who proposes, O ye gods! to dedicate himself to your service: mark how he performs the rites, and, if correctly, accept them at his hands.’

Customs.—Under this head I shall state the usages observed at births, naming, weaning, togavirilis, marriage and death, aggregating what is common, and distinguishing what is peculiar to the Bodo or Dhimáls. The customs of both people have a great similitude, owing to their perfect simplicity. They are derived, in fact, from nature, and nature as little strained by arbitrary devices of man as can well be. At births the mother herself cuts the navel-string, so soon as she has recovered strength for the act. No midwives are found, so that nature must do all, or the mother and offspring perish together. But deliveries are almost always very easy, and death in childbed scarcely known—a blessing derived from the active and unsophisticated manners of the sex. The idea of uncleanness occasioned by births, and by deaths also, is recognised; but the period of uncleanness and segregation is very short, and the purificatory rites consist merely of bathing and shaving, performed by the parties themselves. The infant is named immediately after birth, or as soon as the mother comes abroad, which is always in 4 or 5 days after delivery. There are no family names, or names derived from the gods. Most Bodo and Dhimáls bear meaningless designations, or any passing event of the moment may suggest a significant term: thus a Bhótia chief arrives at the village and the child is called Jínkháp; or a hill peasant arrives, and it is named Góngar, after the titular or general designation of the Bhótias. Children are not weaned so long as their mother can suckle them, which is always from two to three years—sometimes more—and two children, the last and penultimate, are occasionally seen at the breast together. The delayed period of weaning will account in part for the limited fecundity of the women. When a Bodo or Dhimál comes of age, the event is not solemnised by any rite or social usage whatever. Marriage takes place at maturity, the male being usually from 20 to 25 years of age, and the female, from 15 to 20. Courtship is not sanctioned: the parents or friends negotiate the wedlock, though in so simple a state of society it cannot be, but the parties have frequently met and are well known to each other. The Hiudús wisely and decorously attach much discredit to the parent, who takes a “consideration” for the grant of his daughter in marriage. No such delicacy is recognised by Bodo or Dhimál parents, who invariably demand and receive a price, which is called Jan in the language of the former, and Gándi in that of the latter people. The amount varies

from 10 to 15 rupees among the Dhimáls, from 15 to 45 among the Bodo. I cannot learn the cause of the great difference. A youth who has no means of discharging this sum, must go to the house of his father-in-law elect and there literally earn his wife by the sweat of his brow, labouring, more judaico, upon mere diet for a term of years, varying from two as an average, to five and even seven as the extreme period. This custom is named Gaböi by the Bodo—Ghárjyá by the Dhimáls. It, of course, implies a good deal of intercourse between the betrothed youth and damsel prior to their nuptials; but from all I can learn, instances of opportunity abused are most rare. The legal nature and effects of the nuptial contract have been already explained under the head of laws: what concerns fecundity, longevity, &c. under the head of medicine, as a branch of religion. The marriage ceremony is little perplexed with forms. After the essential preliminaries have been arranged, a procession is formed by the bridegroom elect and his friends, who proceed to the bride elect's house, attended by two females specially appointed, to put red lead or oil on the bride elect's head, when the procession has reached her home. There a refectio is prepared, after partaking of which the procession returns, conducting the bride elect to the house of the groom's parents. So far, the same rite is common to the Bodo and Dhimál—the rest is peculiar to each. Among the Dhimáls, the Déóshi now proceeds to propitiate the gods by offerings. Dáta and Bídata, who preside over wedlock, are invoked, and betel leaf and red lead are presented to them. The bride and groom elect are next placed side by side, and each furnished with five pauns, with which they are required to feed each other, while the parents of the groom cover them with a sheet, upon which the Déóshi, by sprinkling holy water sanctifies and completes the nuptials. Among the Bodo the bride elect is anointed at her own home with oil; the elders or the Déóshi perform the sacred part of the ceremony, which consists in the sacrifice of a cock and a hen, in the respective names of the groom and bride, to the sun; and next, the groom, rising makes salutation to the bride's parents, and the bride, similarly attests her future duty of reverence and obedience towards her husband's parent; when the nuptials are complete. A feast follows both with Bodo and Dhimáls, but is less costly among the former than among the latter—as is said, because the higher price paid for his wife by the

Bodo incapacitates him for giving so costly an entertainment. The marriage feast of the Dhimáls is alleged to cost 30 to 40 rupees sometimes, the festivities being prolonged through two and even three days ; whereas 4 to 6—rarely 10 rupees, suffice for the nuptial banquet of a Bodo.

The Bodo and Dhimáls both alike bury the dead immediately after decease, with simple but decent reverence, though no fixed burial ground nor artificial tomb is in use to mark the last resting place of those most dear in life, because the migratory habits of the people would render such usages nugatory. The family and friends form a funeral procession, which bears the dead in silence to the grave. The body being interred, a few stones are piled loosely upon the grave to prevent disturbance by jackals and rats, rather than to mark the spot, and some food and drink are laid upon the grave ; when the ceremony is suspended and the party disperses. Friends are purified by mere ablution in the next stream, and at once resume their usual cares. The family are unclean for three days, after which, besides bathing and shaving, they need to be sprinkled with holy water by their elders or priest. They are then restored to purity and forthwith proceed to make preparations for a funeral banquet, by the sacrifice of a hog to Mainou or Timáng, of a cock to Báthó or Pochima, according to the nation. When the feast has been got ready and the friends are assembled, before sitting down, they all repair once again to the grave, when the nearest of kin to the deceased, taking an individual's usual portion of food and drink, solemnly presents them to the dead, with these words, 'take and eat : heretofore you have eaten and drank with us : you can do so no more : you were one of us : you can be so no longer : we come no more to you : come you not to us.' And thereupon the whole party break and cast on the grave a bracelet of thread priorly attached, to this end, to the wrist of each of them. Next the party proceed to the river and bathe, and having thus lustrated themselves, they repair to the banquet, and eat, drink and make merry as though they were never to die ! A funeral costs the Dhimáls from four to eight rupees—something more to the Bodo, who practise more formality on the occasion, and to whom is peculiar the singular leave-taking of the dead just described.

Useful Arts.—As already observed, the arts practised by the

Bodo and Dhimáls are few, simple and domestic. Agriculture is the grand and almost sole business of the men, but to it is added the construction and furnishing of the dwelling house in each of the frequent migrations of the whole people. The boys look after the domestic animals. The women, aided by the girls, are fully employed within doors in spinning, weaving and dying the clothing of the family, in brewing, and in cooking. The state of the arts will be sufficiently and most conveniently illustrated by a description of the household furniture, clothes, food and drinks of the people, preceded by an account of the implements, processes, and products of agriculture.

Agriculture.—The agricultural implements are an ax to fell the forest trees, a strong bill or bill-hook to clear the underwood and also to dig the earth, a spade for rare but more effectual digging, and lastly a dibble for sowing the seed. The ax is called Rúa by the Bodo, Dúphé by the Dhimáls. It is a serviceable implement of iron (the head) similar to that in use in the plains where the head is bought; the haft being made at home. The bill, called Chékhá by the Bodo, Ghongóĩ by the Dhimáls, is a “jack of all work,” like in shape to our English bill, but with the curved extremity or beak prolonged and furnished with a straight downward edge of some three inches. It is of iron, of course, and purchased in the Kócch marts. The spade is the ordinary short, bent one of the plains, where it is bought, and where it is called Kódál. The Bodo and Dhimáls use it but little, and have no name of their own for it. The dibble is a wooden staff about 4 feet long, made by the people themselves. It is like a stout walking staff sharpened at the lower end. The process of culture, emphatically called ‘clearing the forest,’ is literally such for the most part, and would be so wholly, but that several of the species grown being biennials, a field is retained over the first year, so that the second year’s work consists merely of weeding and resowing rice amid the other standing products. The characteristic work is the clearing of fresh land, which is done every second year, and thus, axes and bills clear away the wood: fire completes what they have left undone, and at the same time spreads over the land an ample stratum of manure (ashes); the soil is worked nearly enough in eradicating the undergrowth of trees (for the lords of the forest are only truncated); so that what little additional digging is needed, may be and is performed with the square

end of the bill. 'Tis no great matter, and firing is the last *effectual* process. Amid the ashes the seed is sown by a dibbler and a sower, the former of whom, walking erect, perforates the soil in quincunxes by sharp strokes of his pointed staff, (called *Shómán* by the Bodo and *Dhúmsi* by the *Dhimáls*) so as to make a series of holes from one to two inches deep, and about a span apart; whilst the latter, following the dibbler, and furnished with a basket of mixed seeds, drops 4 to 6 seeds into each hole and covers them at the same time. All the various produce raised is grown in this promiscuous style. Chait, Baisákh and half Jeth,* comprise the season for preparing and sowing the soil. Sáwan, Bhádún, Kúár and half Kártik,† that for gathering the various products, save cotton, which is not gathered till Pús-Mágh.‡ The rest are reaped as they successively ripen: first cucurbitaceous plants (Kóhara, Louka, Khíra, Kankara Karelá); then greens (Sem, mattar, Béngan, Chichinda, Póí); then the several edible roots (Yam, Arwi, &c.); then the condiments (Haldi, Adrak, red peppers); then the millets and pulse (Marwa, Kúlti, Urid); then Maize; next rice; then the mustards (Tori or Sarsún or Til), and last of all, cotton. The fields, which are much better worked in eradicating the jungle than those for which the Bengal plough performs the same office, are likewise as much better weeded; and how strange soever to mere English ears, the huge mixture of crops may sound, this mixture does not greatly exceed the practice of Bengal, nor is it inconsistent with good returns, though there be no artificial irrigation whatever. The cotton is a biennial of inferior quality, but it is the main crop, and that from the sale of which in the plains, the Bodo and *Dhimáls* look to provide themselves with the greatest part of the rice they consume; for their own supply is very inadequate. Nevertheless rice is usually spoken of as the crop next in estimation to cotton, though maize and even millet seem to contribute as much to the quantity of home-reared food. The rice grown is similar to the “dry rice”—“the Ghaia” of Nepal—the “summer rice” of the plains. The other articles grown, have all been enumerated above, save Indigo, which, with the cochineal of the forest, and Madder procured from the hills, supplies the Bodo and *Dhimáls*

* March, April, and May respectively.

† July, August, Sept. and Oct. respectively.

‡ December, January.

with dyes. Arhar and a few more of the superior agricultural and horticultural products of the plains are occasionally grown by the Bodo and Dhimáls, whose chief products, however, are those given above, and of them not absolutely all in one field and year, though from 12 to 15 are always there, and include a good supply of vegetables, condiments and cerealea, but the last deficient in the article of rice, which is the principal grain eaten. Of vegetables the favorites are Bégans, cucurbitacea and roots (Thá vel Kin, in their own tongues): of cereals, rice: of condiments, red peppers. Mustards are grown not for their oils, nor as stimulants, but merely for eating like parched peas. The oil seeds are fried and are relished in that state:* the young plants also are used as greens. The surplus seed is sold to the oilmen of the plains, neither Bodo nor Dhimál being wont to express oil, of which they consume little, and that only for cooking. Lights they use none (save on occasions of ceremony and of púja) but go to bed early and sit by the fire—a splendid wood fire—till then. The small quantity of oil used for cooking they buy in the adjacent marts of the Kócch. The cotton crop and the surplus of the mustard crop, are all the agricultural products which they sell any portion of. Cotton is habitually sold, the small portion only that is needed for clothing the family being reserved, which may be about one-fifteenth of what is raised. The domestic animals have been enumerated elsewhere, and must be spoken of again when we come to the head of food. Agriculturally viewed, they are a dead letter, not even their manure being employed.

Upon the whole the agriculture of the Bodo and Dhimáls is conducted with as much skill as that of their lowland neighbours; with skill superior much to that of their highland neighbours; and with pains and industry greatly above those of either highlanders or Kócches. The following details of what is raised by one Bodo cultivator, and consumed by himself, his wife and three young children, imperfect though they be, will help to convey a just idea of his position.

Bodo peasant tilling about $1\frac{3}{4}$ bigha with the spade.

* They are fried with greens, and of course yield up a good deal of their oil to flavour the vegetables.

PRODUCTS OR INCOME.

Dhán or rice in husk,..	24 bisi = 12 maunds =	4	0	0
Cotton undressed,.....	16 bisi = 8 maunds =	32	0	0
Maize,	3 bisi = 1½ maunds =	0	8	0
Milletts and Pulse,.....	4 bisi = 2 maunds =	0	12	0
Condiments, dyes & greens	2 bisi = 1 maund =	4	0	0
Total Rupees, ..		41	4	0

EXPENSES.

Rice in husk, bought, 3 Pouthi = 48 maunds =	15	0	0
Salt bought, 18 Phol = 18 seers =	3	0	0
Cotton field pujá,.....	=	1	0 0
Government tax,	=	1	0 0
Cotton seed bought,.....	=	1	0 0
Ai huno festival,	=	3	0 0
Oil bought for worship and for occasional lights,..	=	0	8 0
Sickness, fees to the Ojhá,	=	4	0 0
Presents to sisters and friends who ask aid and make visits, ..	=	2	0 0
Ornaments for wife,.....	=	2	0 0
Fruits bought for self, wife and children,.....	=	2	0 0
Fish bought in rains when none can be taken in the forest,	=	1	8 0
Earthen vessels bought,	=	0	8 0
Proportion of price of Chékhá or Bill,	=	0	8 0
Ditto ditto of Jong or spear,	=	0	8 0
Ditto ditto of metallic pots and pans,	=	0	8 0
Sundries,	=	2	0 0
Total Rupees, ..		40	0 0

Balance in favour,..... 1 4 0

It has been already mentioned that the Bodo and Dhimál peasant is liable to a corvee or labour tax, the items of which may be added thus—for the Rajah 3 days, thrice a year or 9 days—for the Rajah's local representative, 6 days—for the village priest or Déóshi, 3 days—Total 18 days per annum. This is so much deducted from his resources, and

may be stated at 2* rupees in coin. A peasant of the plains, using the plough, will earn twice or even thrice as much as a Bodo or Dhimál, and yet, what with the wretched system of borrowing at 25 to 30 per cent. and the grievous extra frauds incidental to that system, he will not be nearly so well off. The Bodo or Dhimál again, has abundance of domestic animals, and is moreover at liberty to eat the flesh of all save the cow, whereas the peasant of the plains has few, and of those only the goat that he can eat. And, lastly, the Bodo's industrious wife not only spins, but weaves and dyes all the clothes of the family, besides supplying it amply with wholesome and agreeable beer, whilst the peasant's wife in the plains does nothing but spin; and though this may diminish the cost of the family clothing, still it must be bought, nor will there be much thread to dispose it in free sale, apart from the clothier. The highland peasantry, generally, earn less than the Bodo and Dhimáls, and are proportionally worse off, though lightly taxed and exempt from the curse of the borrowing system. The Newár peasants of the great valley of Nepal,—as industrious as the Bodo and Dhimáls—nay more so—and more skilful too,—earn more and retain more notwithstanding the heavy *rent* they pay to their landlord, who pays the light tax or Government demand on the land.

Houses.—The Bodo and Dhimáls build and furnish their own houses without any aid of craftsmen, of whom they have none whatever. They mutually assist each other for the nonce, as well in constructing their houses as in clearing their plots of cultivation, merely providing the helpmates with a plentiful supply of beer. A house is from 12 to 16 cubits long by 8 to 12 wide; a smaller house of the same sort is erected opposite for the cattle, and if the family be large, two other domiciles like the first are built on the other sides, so as to enclose an open quadrangle or yard. The houses are made of jungle grass secured within and without by a trellice work of strips of bamboo. The roof has a high and somewhat bulging pitch, and a considerable projection beyond the walls. It also is made of wild grass, softer than that which forms the walls. There is only one division of the interior which separates the cooking and the sleeping portions of the house, which has no chimney or window, and but one door. Ten to forty such

* If the Bodo pay one rupee of direct and two of indirect taxes, he will be nearly on a level, quoad public burdens, with the peasant of the plains.

houses form a village, without any rigid uniformity or any defences whatever.

Furniture is very scant, consisting only of a rare bedstead, some sleeping mats, a stool or two, and some swinging-shelves; and all of these are made at home. Household utensils are a few earthen vessels for carrying and holding water, some metallic cooking, eating, and drinking pots, and a couple of knives, to which we must add the spinning, weaving, dyeing, and brewing apparatus of the women. All the latter are of the simplest possible form and homemake: the earthen and metallic pots and pans are purchased in the Kóceh marts. There are none of iron nor of copper; all are of brass or of other mixed metals that are metallic, owing, it is said, to the dearness of iron and copper. There are no leathern utensils. Baskets of bamboo and of cane and ropes of grass, are abundant and of homemake, by the men who likewise haft all the iron implements they purchase abroad, for agricultural or domestic uses. It has already been said that lights are dispensed with beyond what is afforded by an ample fire.

Clothes.—With both people they are made at home and by the women. The Bodo women wear silk procured from the castor plant worm, which they rear at home in each family. The Bodo men and Dhimáls of both sexes wear cotton only. Woollen is unknown, even in the shape of blankets. The manufactures are durable and good, and not inconveniently coarse—in fact, precisely such as the people require: and the dying is very respectably done with their own cochineal, morinda, or indigo, or with madder got from the hills—but all prepared by themselves. The female silk vest of the Bodos possessed by me is $3\frac{1}{2}$ feet wide by 7 long, deep red, with a broad, worked margin of cheque pattern—and of white and yellow colours, beside the ground red—above and below. This garment is called Dókhana by the Bodo, and must be a very comfortable and durable dress, though it somewhat disfigures the female form by being pressed over the breast as it is wrapped round the body, which it envelopes from the armpits to the centre of the calves. The female garment of the Dhimáls differs only in material, being cotton. It is called Bónha. The male dress of the Bodo consists of two parts—an upper and a lower. The former is equivalent to the Hindu chadar or toga. It is called Shúmá, and is 9 to 10 cubits by 3. The latter, styled Gámchá, and which is 6 cubits by 2, is equivalent to the Hindu

Dhoti, and after being passed between the legs is folded several times round the hips and the end simply tucked in behind. The male dress of the Dhimáls is similar : its upper portion is called Pátaka—its lower, Dhári—the whole, Dhába with this people—Hí with the Bodo. All cotton clothes, whether male or female, are almost invariably white or undyed. Neither Bodo nor Dhimál commonly cover the head, unless when the men choose to take off their upper vest and fold it round the head to be rid of it. Shoes are not in use ; but a sort of sandals or sole-covers, called Yápthong vel Champoï, sometimes are, and are made of wood by the people themselves. There are no other shoes. Ornaments are rare, even amongst the women, who however wear small silver rings in their ears and noses also, and heavy bracelets of mixed metal on their wrists. These are bought in the Kóech marts, and are quite simple in form.

Food.—The sorts of vegetable food have been already enumerated in speaking of agriculture ; rice is the chief article : wheat or barley, unknown even by name. Ghiu or clarified butter, is likewise totally unused and unnamed, and oil is very sparingly consumed for food. Salt, chillies, vegetables, plenty of rice, varied sometimes with maize or millet, and fish or flesh every second day, constitute, however, a meal which the poor Hindu might envy, washed down as it is with a liberal allowance of beer. Plenty of fish is to be had from December to February, both inclusive, and plenty of game from January to April inclusive, though the Bodo and Dhimál are no very keen or skilful sportsmen, notwithstanding the abundance of game and freedom from all prohibitions. They have the less need to turn hunters in that their domestic animals must supply them amply with flesh. They have abundance of swine and of poultry, and not a few of goats, ducks and pigeons, but no sheep nor buffaloes, and cows are scarce ; milk is little used, but not eschewed, as by the Gárós it is. They may eat all animals, tame or wild, save oxen, dogs, cats, monkeys, elephants, bears and tigers. Fish of all sorts, land and water tortoises, mungoes, civets (not cats !), porcupines, hares, monitors of enormous size, wild hogs, deer of all sorts, rhinoceros, and wild buffaloes, are amongst the wild animals they pursue for their flesh ; and altogether they are abundantly provided with meat.

Drinks and stimulants.—The Bodo and Dhimáls use abundance of a

fermented liquor made of rice or millet, which the former call Jó, the latter, Yú. It is not unpleasant, and I should think was very harmless. Its taste is a bitterish subacid, and it is extremely like the Ajimana of the Névárs of Nepal. Brewing and not distilling, seems to be a characteristic of nearly all the Tamulian races, all of whom drink and make beer—and none of them, spirits. The Bodo and Dhimál process of making this fermented liquor is very simple : the grain is boiled : the root of a plant called Agaichito is mixed with it : it is left to ferment for two days in a nearly dry state : water is then added, quant. suff. ; the whole stands for 3 or 4 days, and the liquor is ready. The Agaichito plant is grown at home : its root, which serves for balm, is called Emon. I have never seen it. Besides this beer—of which both people use much—they likewise freely use tobacco ; but never opium nor hemp in any of the numerous preparations of both ; nor distilled waters of any kind ; and upon the whole, I see no reason to brand them with the name of drunkards, though they certainly love a merry eup in honour of the gods at the high festivals of their religion. Among my own servants the Bodo have never been seen drunk : the Moslems and Hindús, several times excessively so.

Manners.—The manners of the Bodo and Dhimáls are, I think, a pleasing medium between the unsophisticated roughness of their highland neighbours, and the very artificial smoothness of their neighbours of the plains. They are very shy at first ; but when you know them they are cheerful without boisterousness and inquisitive without intrusion. Man's conduct to woman is always one of the best tests of his manners : now the Bodo and Dhimáls use their wives and daughters well ; treating them with confidence and kindness. They are free from all out-door work whatever ; and they are consulted by their husbands as their safest advisers in all domestic concerns, and in all others that women are supposed likely to understand. When a Bodo or Dhimál meets his parent or one of the elders of the community, he drops his joined hands to the earth, and then raises them to his forehead ; and if he be abroad he says ' father, I am on my way,'—to which the parent or senior answers, ' may it be well with you.' There is little visiting save that which is inseparable from the frequent religious feasts and festivals, already sufficiently described, nor are amusements or pastimes for young or old common. Indeed, children or

women seem to have none, and the men so little heed them, that neither the Bodo nor Dhimál tongue has a word of its own for sport, play or game ! The young men, however, have two games, which I proceed to describe summarily. In the light half of October, on the day of the full moon, a party of youths proceed at nightfall from village to village, like our Christmas-wakers, hailing the inhabitants with song and dance, from night till morn, and demanding largess. This is given them in the shape of grain, beer and cowries, wherewith on their return they make a feast, and thus ends the pastime, which is called Harnaharni by the Bodo, and Harna-dháká by the Dhimáls. Again, in the dark half of the same month, when the wane is complete, the youths similarly assemble, but in the daytime, and dressing up one of their party like a female, they proceed from house to house and village to village, saluting the inhabitants with song and dance, and obtaining presents as before, conclude the festival with a merry making among themselves. The Bodo name of this rite or game is Chórgéléno—the Dhimáls call it Chórdháká. And now we shall conclude the subject of manners with a statement of the ordinary manner in which a Bodo or Dhimál passes the day. He rises at day spring, and having performed the offices of nature and washed himself, he proceeds at once to work in his field till noon. He then goes home to take the chief meal of the day, and which consists of rice, pulse, fish or flesh (on alternate days), greens and chillies, with salt—never ghiu—seldom oil. He rests an hour or more at noon, and then resumes his agricultural toils, which are not suspended till night-fall. So soon as he has got home, he takes a second meal with his family—then chats a while over the fire, and to bed betimes—seldom two hours after dusk. If the children be young, they sleep with their parents—if older, apart. The Bodo call their first meal Sanjúphúni inkhám—their second, Bílíní inkhám. The Dhimál name for the first is Mánjbéla-cháká ; for the second, Dilima-cháká. Wives usually eat after their husbands—children with.

Character.—The character of the Bodo and Dhimáls, as will be anticipated from the foregone details, is full of amiable qualities—and almost entirely free from such as are unamiable. They are intelligent, docile, free from all hard or obstructive prejudices, honest and truthful in deed and word, steady and industrious in their own way of life ; but apt to be mutable and idle when first placed in novel situations, and to

resist injunctions, injudiciously urged, with dogged obstinacy. They are void of all violence towards their own people or towards their neighbours, and though very shy of strangers, are tractable and pleasant when got at, if kindly and cheerfully drawn out. The Commissioner of Assam, Major Jenkins, who has by far the best opportunities for observing them, *when drawn out of their forest recesses*, gives them, as we have seen, a very high character as skilful, laborious cultivators, and peaceable respectable subjects; whilst that this portion of them want neither spirit nor love of enterprise, is sufficiently attested by the fact, that when the Dorjiling corps was raised two-thirds of the recruits first obtained were Bodo of Assam. Neither the Bodo nor Dhimál however, can be characterised, upon the whole, as of military or adventurous genius, and both nations decidedly prefer, and are better suited for the homebred and tranquil cares of agriculture. They are totally free from arrogance, revenge, cruelty and fierté; and yet they are not devoid of spirit, and frequently exhibit symptoms even of that passionate or hasty temperament, which is so rare, at least in its manifestations, in the east. Their ordinary resource against ill-usage is immovable passive resistance: but their common demeanour is exempt from all marks of the wretched alarm, suspicion and cunning that so sadly characterise the peasantry of the plains in their vicinity, and which, being habitual, must be fatal to truth. The Bodo and Dhimál in this respect, as in most others, more nearly resemble the mountaineers, whose straight-forward manly carriage so much interests Europeans in their favour. Oppression and its absence beget these different phases of character. The absence of all petty trade likewise contributes materially to the candour and integrity of the Bodo and Dhimáls. Among all mankind, women, wine, and power are the great tempters, the great leaders astray. Now the Bodo and Dhimáls rise decidedly superior to the first temptation; are not unduly enslaved to the second; and, from the perfect equality and subject condition of the whole of them, are entirely exempted from the third. Power cannot mislead those who never exercise it: where women are esteemed and no artificial impediments whatever exist to prevent marriage, women are a source, not of vice, but of virtue: and, lastly, where "honest john barley corn" is free from the dangerous alliance of spirits, opium and hemp, I know not that he, even if assisted by the "narcotic weed," need be set down as a

necessary corrupter of morals. True, the Bodo and Dhimál do not pretend to the somewhat pharisaical abstemiousness *or* cleanliness of the Hindús. But I am not therefore disposed particularly on Hindú evidence, to tax them with the disgusting vices of drunkenness and dirtiness, though these, and obstinacy, *if any*, are the vices we must lay to their charge, as the counterpoise of many and unquestionable virtues. Peasant, be it remembered, must be compared with peasant, and not peasant with people of higher condition; and if the comparison be thus fairly made, it may perhaps be truly decided, that the Bodo and Dhimál are *less* sober and *less* cleanly and *less* tractable than the people of the plains—*more* sober and *more* cleanly and *more* tractable than those of the hills. The Bodo and Dhimáls are good husbands, good fathers and not bad sons; and those who are virtuous in these most influential relations, are little likely to be vicious in less influential ones, so that it need excite no surprise that these people, though dwelling in the forest, apart from the inhabitants of the open country, are never guilty of black mailing or dacoity against them, whilst among themselves crimes of deep dye are almost unknown. To the ostentatious hospitality of many nations whose violence against their neighbours is habitual, they make no pretensions; but among their own people they are hospitable enough, and towards the stranger, invariably equitable and temperate.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL,
FOR JULY, 1849.

At a meeting of the Asiatic Society held on Wednesday, the 4th July, 1849.

The Hon'ble Sir J. W. COLVILLE, President, in the chair.

The proceedings of the June meeting were read and confirmed, and the accounts and vouchers of the preceding month were laid upon the table.

Robert Cathcart Dalrymple Bruce, H. M. S. who had been duly proposed and seconded at the June meeting, was ballotted for and elected.

The following gentlemen were proposed for election at the August meeting :—

Arthur Grote, Esq. B. C. S. proposed by Dr. Falconer, seconded by Mr. R. W. G. Frith.

Doctor Martin, proposed by Mr. F. P. Strong, seconded by Capt. Latter.

Read letters—

From W. Seton Karr, Esq., under Secretary to the Government of Bengal, presenting for the use of the Museum of Economic Geology, a Map of the district of Patna.

From E. Madden, Esq. forwarding Supplementary Notes to his article entitled "The Turace and Outer Mountains of Kumaon," which appeared in the Society's Journal for May and June, 1848.—(Ordered to be printed in the Journal.)

From James Hume, Esq. Honorary Secretary to the Agricultural and Horticultural Society of India, forwarding some specimens of iron ore

from the banks of the Damooda, for the Museum of Economic Geology, and requesting the opinion of the Society thereon.—(Referred to the Curator, Museum of Economic Geology.)

From Captain M. Kittoe, forwarding a transcript of an inscription cut on a thick brick, found in a field near Jaunpoor, and strongly advising the Society to send him all the old Copper Plates now in the Museum for re-transcription and classification. Capt. Kittoe continues,—

“Having, while on my recent tour heard of a fine pillar at Pahladpoor, near Jhagupoor, I sent my inscription hunters to examine it. It is the same pillar which Major Burt brought to Mr. Prinsep’s notice just as our lamented friend was leaving for Europe. The Major only sent an impression, of the single line, which occurs about midway on the pillar, and this impression was mislaid. I have now several copies before me, and moreover two or more of the “shell pattern,” only most highly ornamented, with dragon-like flourishes, and a sentence to each in the Thibetan Sanscrit character, which I here enclose.* You will observe that there are six syllables, so are there six shells. But Thibetan writing is within the scrolls or dragons of the shell pattern.

The pillar is apparently a pillar of victory of some Kshetri prince, whose name is unfortunately effaced. The character is that found in the caves of Western India, given by Col. Sykes and Mr. Watlen. I have no pure copies of the shells, or I would have sent them. Mr. Laidlay has most ingeniously guessed at the meaning, and supposes the words to be Aum mané padma^{1 2 3 4 5} hom,⁶ but here the six syllables are differently expressed, in the Thibetan, and in two ways.

From the position of Pahladpoor, some inclined to think it has been the “Temple of the vast solitude of Fa Hian.” Referred to the Oriental Section.

From Dr. E. Roer, Secretary Oriental Section, returning Captain Ellis’s letters and their enclosures, and intimating the Section’s opinion that the questions therein contained should be translated into English, and the most interesting ones printed in the Journal. Also submits a translation of the questions for the information of the Society.

From the same—forwarding the following extracts of letters from European scholars with regard to the publication of the Vedas.

* These have not yet come to hand; we shall be very glad to receive them.
—Eds.

Extract of a letter from Dr. MULLER, dated the 23rd April, 1849.

"Your edition of the Brihad Aranya Upanishad, at least the first four numbers, has arrived in England, but I have been of late so busy that I had as yet no time to read it. At any rate, it is delightful to have all the material so near at hand, and I hope that the *Bibliotheca Indica* will remain an inexhaustible mine for the Sanskrit.

Now in Europe we'll be able to publish the Taittirīya Sanhitā or Brāmhana. Of the first there is only one MS. containing 7 Ashtakas, in Colebrooke's collection, and a portion of the commentary to the 7th Ashtaka; and there is no complete copy of the Taittirīya Brāmhana. I believe, however, it is the same with the Āpastamba Brāmhana, of which three books are in Colebrooke's collection. If you will do service to the Sāma Veda, why not publish the Tāndya Brāmhana?"

Extract from a letter of Dr. WEBER of Berlin, dated 27th Jan. 1849.

"A publication of the 50 Upanishads, translated by Anquetil, would be of much greater importance. Only five of them have as yet been printed, viz. Kéna, Isá, Káthaka, Mundaka, and the Brihad Aranyaká in the Kamvasákha. (Bonn, 1844, by Poley). The Chandógya Upanishad is being prepared for the press since some years already by Windishmann; but many years may still elapse, before it will be printed. The work, however, whose publication is of the greatest importance, is the Taittirīya Yajur. I have examined the libraries in England, in Paris and here, and may assure you, that an edition of the Yajur is impossible in Europe. With reference to this I have written a small paper, which will appear in the next number of Lassen's Journal. According to your advice I wrote to the Societies in Bombay and Madras with regard to my edition of the white Yajur, and took at the same time the liberty of requesting them to look out for MS. of the Taittirīya Yajur, and to transmit them to you. There are at any rate MSS. of the commentary of Sáyana in Benares, as I have read in the Journal of your Society. About 230 pages of the white Yajur have been printed, and the first volume, containing 320 pages, will be published at the commencement of April (in London, at Williams' and Norgate, at 21 shillings).

Rev. Benfey in Goettinger HAS PUBLISHED a most excellent edition of the Sāma Sanhitā, with gloss, translation and a copious introduction. The 7—12 books of Roths' *Nirukta* may soon be expected. Lassen writes to me, that a further portion of his Indian Antiquities, containing Indian history to Vikramaditya, will probably appear about Easter. Stewgler prepares an edition of Yajnavalkya, which is to be ready at the same time. Trithen in Oxford has lately published Bhavabhúti's Uttara Rāma Charitra. Mueller's

Rig Veda amounts already to 640 pages. The first volume will appear about Easter. Boethlinck in Petersburg is busy with Tibetan and Jakútan studies. Professor Brockhaus publishes Burnouf's *Vendidad Sade* in Latin characters, together with a complete glossary, which will make the Zend accessible to the learned."

Extract from a letter of Professor LASSEN.

"I hope the Society have received the second part of my Indian Antiquities. The second volume is now printing, and pretty far advanced. I trust, I shall have finished within the next two months the first part of this volume, containing the history till Vikramaditya. This part of Indian history is one of the most interesting, as we have so exact records on the history of Alexander, and as there is so rich a source of information in the inscriptions of Asóka, which in my opinion are hitherto not properly made use of.

The following information on the progress of the labours relative to Védaic literature may be interesting to you; the first volume of Mueller's *Rig Véda* is nearly completed. Weber in Berlin publishes the white Yajur with a commentary of Mádhava. Dr. Aufrecht at Berlin is occupied with the preparatory labours of an edition of the Atharva. We may therefore hope, that in a short time the Véda, in the strict sense of the word, with the exception of the black Yajur, will be published. There are, however, several works of importance, necessary for its explanation, still to be published, by the edition of which the Asiatic Society would do a great service to Védaic literature."

From Rev. Mr. Mackay, requesting a copy of the Asiatic Researches and some parts of the Journal, for the Free Church Institution.

Ordered that the Society regret that they are unable to grant the request, as it is contrary to the rules of the Society.

From Capt. J. D. Cunningham, "Note on the Limits of Perpetual Snow in the Himalayas." (Ordered to be printed in the Journal).

From Captain Thos. Hutton—"Notices of some Land and Fresh water shells occurring in Afghanistan." (Ordered to be printed in the Journal).

From J. W. Laidlay, Esq. V. P. "Comparative Vocabulary of the Sghá and Pghó dialects of the Karens; with observations on the grammatical peculiarities of those languages." (Ordered to be printed in the Journal).

From H. Piddington, Esq. examination of a new mineral, Haughtonite.

From the same—Catalogue of Presentations, Geological, Paleontological and Minerological.

Read Report of the Curator of the Museum of Economic Geology, for the month of June.

(True Copy) J. W. COLVILE, *President*.
J. W. LAIDLAY, *Sec.*

LIBRARY.

The following books have been received since the last meeting :—

Presented.

The Journal of the Indian Archipelago, for May, 1849.—PRESENTED BY THE GOVERNMENT OF BENGAL.

The Calcutta Christian Observer, for July, 1849.—BY THE EDITORS.

Upadeshaka, No. 31.—BY THE EDITOR.

The Oriental Baptist, No. 31.—BY THE EDITOR.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of May, 1849.—BY THE DEPUTY SURVEYOR GENERAL.

A discourse delivered at the Hindu College on the Hare Anniversary, Friday, June 1st, 1849. By the Rev. K. M. Banerjea.—PRESENTED BY BABU PEARYCHAND MITTRA.

Purchased.

The Edinburgh Review, Nos. 167, 170, 171 and 180.

The Calcutta Review, Nos. VI. VII. X. XI. and XXII.

Comptes Rendus, Nos. 10 and 12.

The Annals and Magazine of Natural History, No. XVI.

Illustrations of Indian Ornithology. By T. C. Jerdon, Esq. No. IV. (2 copies).

Donation to the Museum.

A Portrait of Henry Torrens, Esq. B. C. S. Presented by F. C. Lewis, Esq.; forwarded by Mr. Taylor.

Observations made at sunrise.

Temperature. Wind.

Aspect of Sky.

Minimum Pressure observed at 9h. 30m.

Temperature. Wind.

Aspect of Sky.

Observations made at apparent noon

Temperature. Wind.

Aspect of Sky.

Date.	Bar. red. to 32° F.	Temperature.			Wind.	Aspect of Sky.	Bar. red. to 32° F.	Temperature.			Wind.	Aspect of Sky.	Bar. red. to 32° F.	Temperature.			Wind.	Aspect of Sky.
		Of Mer.	Of Air.	W. Bulb.				Of Mer.	Of Air.	W. Bulb.				Of Mer.	Of Air.	W. Bulb.		
15	Inches 29.468	78.0	78.7	76.8	N. W.	Cloudy.	Inches 29.529	83.3	81.8	78.3	S. E.	Cloudy.	Inches 29.493	87.0	85.8	74.7	S. W.	Cumulo strati.
16	481	78.8	79.2	77.8	S. E.	Ditto	563	83.2	82.4	78.9	S. S. E.	Cumulo strati.	554	85.2	81.6	80.2	S. E.	Ditto
17	795	79.2	79.8	78.7	S. E.	Cumuli.	631	90.6	88.0	81.5	S. L.	Ditto	589	91.9	89.3	81.6	S. S. E.	Ditto
18	594	80.3	81.0	79.5	S. S. E.	Cirro strati.	625	87.3	83.9	81.4	S. L.	Ditto	580	92.2	90.5	82.5	S. W.	Ditto
19	584	80.1	81.0	79.3	S. S. W.	Ditto	602	89.8	88.9	81.3	S. W.	Cumuli.	590	92.3	91.6	82.9	S. W.	Ditto
20	590	81.3	82.3	80.3	S. S. W.	Cirro cumuli.	621	89.0	88.2	81.5	S. W.	Cumulo strati.	601	92.0	91.3	83.3	S. W.	Cumulo strati.
21	563	82.8	83.1	80.0	S. W.	Cloudy.	614	84.3	84.6	79.2	S. W.	Cloudy.	582	88.1	87.9	80.8	S. W.	Ditto
22	619	81.5	82.3	80.4	S. S. W.	Ditto	628	76.3	77.0	75.9	N. N. W.	Heavy.	675	76.9	77.0	76.2	S.	Rainy.
23	715	76.6	77.7	76.9	S.	Rainy.	724	81.5	82.6	79.8	S. S. E.	Cloudy.	703	81.7	81.0	83.2	S. S. W.	Cirro cumuli.
24	678	81.0	81.8	80.3	S. S. W.	Cloudy.	721	81.0	82.4	82.8	S. S. W.	Cumuli.	623	91.8	90.5	81.5	S. S. W.	Cumuli.
25	663	81.3	82.2	80.2	S. W.	Cirro cumuli.	680	84.9	88.0	81.8	S. W.	Cumulo strati.	652	91.8	91.0	82.1	S.	Cumulo strati.
26	625	81.8	82.2	80.5	S.	Cumuli.	652	84.3	89.0	81.7	S. S. W.	Cumuli.	639	90.9	81.8	81.5	S. S. W.	Ditto.
27	650	81.2	82.2	80.3	S.	Cloudy.	674	81.2	88.5	80.7	S. S. W.	Cirro cumuli.	679	90.3	90.0	87.0	S.	Cumuli.
28	629	82.2	83.0	80.9	S.	Cirro cumuli.	626	89.2	88.7	82.7	S.	Cloudy.	623	92.0	91.6	82.9	S. S. W.	Cumulo strati.
29	581	82.0	82.9	80.2	S.	Cloudy.	639	89.9	89.4	82.2	S. W.	Cirro cumuli.	642	90.6	90.0	82.8	S. W.	Cloudy.
30	...	...	...	...	...	...	666	91.0	90.8	81.5	S.	Cumulo strati.	614	92.9	92.0	83.5	S.	Cumulo strati.
31	...	...	...	...	...	...	650	90.5	90.0	83.0	S.	Ditto	626	92.0	91.5	81.7	S.	Ditto
1	...	...	...	...	...	...	647	82.0	82.0	80.0	S. W.	Cloudy.	685	85.0	84.9	81.2	S.	Cloudy.
2	...	...	...	...	...	...	736	91.0	88.8	82.0	S. S. E.	Cumulo strati.	716	93.8	91.7	81.0	S. S. E.	Cumulo strati.
3	624	80.2	80.8	79.1	S.	Cirro strati.	656	92.2	89.3	82.7	S. E.	Ditto	636	83.3	81.0	82.9	S. E.	Ditto
4	576	80.2	80.8	79.2	S. E.	Ditto	620	90.6	88.0	81.7	S. E.	Ditto	611	91.0	88.9	80.8	S. E.	Nimbi.
5	642	80.0	80.8	79.0	E.	Scatd. clouds.	659	89.5	86.5	80.3	E.	Ditto	646	86.9	85.4	81.4	E.	Cumulo strati.
6	592	79.8	80.2	78.3	E.	Cirro strati.	595	88.7	87.1	81.3	E.	Ditto	568	86.2	83.0	80.5	E.	Rainy.
7	...	...	...	...	...	...	522	90.1	87.2	81.9	E. S. E.	Ditto	499	92.0	89.3	82.0	S. E.	Cumulo strati.
8	474	79.8	80.3	78.8	E.	Cloudy.	493	87.0	83.8	80.7	S. E.	Nimbi.	471	90.7	89.8	82.3	S. S. E.	Ditto
9	473	79.8	80.0	78.8	E.	Ditto	513	81.0	86.3	81.7	L. N. E.	Cumulo strati.	482	87.6	86.3	82.0	N. E.	Ditto
10	411	81.2	81.2	79.8	S.	Ditto	474	88.7	87.5	83.0	S. S. W.	Cloudy.	436	92.0	90.6	83.6	N. E.	Ditto
Mean	29.584	80.4	81.1	79.3	...	...	29.624	87.9	86.6	81.1	...	...	29.604	93.0	88.7	82.2	...	...

[Meteorological Register continued.]

Observations made at 2h. 40m.					Minimum Pressure observed at 4 p. m.					Observations made at 11m. 30s.					Maximum and Minimum Thermometer.					Rain Gauges.			Moon & phases.	Date.
Inch. red. to 32° F.	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Inches	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Inches	Of Mer.	Of Air.	W. Bulb.	Aspect of Sky.	Max.	Min.	Min.	Max. therm. in sun's ray.	Upper.	Lower.	Upper.	Lower.		
29.409 91.2	90.0	82.0	S. W.	Cumulo strati.	29.387	90.2	88.8	80.8	W N W	Nimbi.	29.427	86.4	81.8	80.0	W N W	Rainy.	91.8	81.6	77.4	110.2	2.40	2.48	1	
.497 84.3	87.3	80.3	S.	Do.	.487	89.0	86.9	80.6	S. W	Cumulo strati.	.517	82.7	82.8	78.1	S	Clear	88.8	83.9	79.0	108.7			2	
.554 91.0	90.4	81.9	S.	Do.	.527	92.8	91.2	81.8	S.	Nimbi.	.550	84.3	85.0	81.8	S. W	Cirro strati.	93.2	86.6	79.9	110.3	0.30	0.36	3	
.542 89.4	85.7	81.2	S S E.	Drizzly.	.532	86.4	86.6	82.5	S. S. E.	Cloudy.	.546	84.5	84.7	80.3	S.	Do.	93.0	87.0	81.0	111.7			4	
.528 92.5	92.0	81.4	S.	Cumulo strati.	.503	92.9	91.9	80.4	S.	Cumulo strati.	.529	87.3	87.3	80.7	S.	Cirro cumuli.	94.2	87.8	81.3	109.0	0.14	0.22	5	
.533 92.2	91.4	84.2	S.	Cumulo strati.	.526	92.1	91.8	84.3	S.	Cumulo strati.	.528	86.6	86.7	81.8	S.	Scattered clouds	93.3	87.4	81.5	105.4			6	
.524 89.4	88.3	80.1	S.	Drizzly.	.572	91.0	79.1	77.7	N. W	Rainy.	.576	78.7	79.0	77.3	S.	Drizzly.	90.2	86.9	83.5	98.0	0.92	1.00	7	
.665 77.0	77.4	76.3	S. W.	Cloudy.							.661	79.0	79.0	77.3	S.	Cloudy.	82.8	79.7	76.6		2.26	2.30	8	
.679 91.2	90.2	83.7	S. W.	Cumulo strati.	.646	89.5	88.8	83.0	S. S. W	Cumulo strati.	.658	86.6	86.5	82.2	S. W	Cloudy to Nor.	91.7	83.9	76.0	105.7			10	
.644 90.7	90.0	83.5	S. W.	Do.	.621	87.7	87.0	82.2	S. S. W	Cloudy.	.603	85.3	85.6	80.9	S. S. W	Cloudy.	92.4	87.0	81.5	102.2			11	
.592 92.2	90.7	83.8	S. W.	Do.	.567	91.4	90.5	82.8	S. S. W	Cumulo strati.	.560	86.2	86.3	81.3	S. S. W	Cirro.	93.6	87.8	82.6	106.8			12	
.562 92.3	91.4	82.4	S.	Do.	.558	91.3	90.7	81.0	S.	Cirro strati.	.575	86.8	86.6	80.6	S.	Scattered cloud.	93.0	81.5	82.2	105.0			13	
.638 92.0	91.8	83.9	S. W.	Do.	.618	89.8	89.4	82.8	S.	Cumulo strati.	.613	87.1	87.7	81.7	S.	Cumulo strati.	92.8	87.4	82.0	101.0			14	
.594 92.8	92.4	84.2	S. W.	Do.	.579	92.0	91.3	83.5	S.	Do.	.580	87.5	87.5	82.0	S. W.	Clear.	93.9	88.5	83.0	108.0			15	
.562 92.0	92.2	82.9	S. S. W.	Do.	.537	93.0	92.5	83.1	S. W.	Do.	.547	88.0	88.0	83.5	S.	Cloudy.	93.4	88.1	82.7	103.2			16	
.564 92.3	91.2	83.0	S.	Cirro cumuli.	.562	92.2	91.3	81.7	S.	Cirro cumuli.							93.0	88.0	83.0	105.0			17	
.618 84.0	84.0	79.7	S.	Cloudy.	.603	84.6	81.5	79.0	S.	Cloudy.							94.0	87.0	80.0				18	
.583 93.5	92.2	82.0	S.	Do.	.560	92.0	91.0	81.7	S.	Do.							91.5	88.0	81.5	107.0			19	
.576 93.0	91.5	83.2	W.	Do.	.535	91.6	91.2	82.8	S.	Cumuli.							95.5	89.3	83.0	111.0	1.70	1.74	20	
.586 90.7	90.0	83.5	S.	Cumulo strati.	.571	90.0	88.9	82.2	S.	Cloudy.							91.0	87.0	83.0	102.5			21	
.659 89.8			S.	Rainy.	.627	88.0	87.7	82.0	S. E.	Cumulo strati.	.624	86.0	85.9	81.2	S.	Cirro strati.	95.0	87.4	79.8	112.3	0.12	0.18	22	
.582 92.2	88.8	80.7	E. S. E.	Cloudy.	.545	90.4	89.0	81.4	E. S. E.	Cloudy.	.549	86.7	86.5	80.7	S.	Cirro cumuli.	92.3	86.7	81.0	111.2			23	
.563 86.3	85.3	81.0	E.	Nimbi.	.545	89.9	80.7	77.7	W.	Do.	.575	83.0	83.0	80.4	N. E.	Cumulo strati.	90.7	85.9	81.0	110.5	0.38	0.42	24	
.594 89.3	88.1	82.3	N. E.	Do.	.557	88.8	86.0	81.5	E. S. E.	Nimbi.	.576	84.2	84.4	81.4	E. S. E.	Do.	90.8	85.7	80.8	107.2	0.38	0.40	25	
.499 88.1	87.0	82.2	N. E.	Cumulo strati.	.479	88.5	83.8	81.2	E.	Rainy.	.490	83.5	84.0	79.2	S. S. E.	Scattered clouds	90.0	85.0	80.0	106.0	0.74	0.78	26	
.455 84.8	82.5	80.0	E.	Cloudy.	.431	84.8	83.2	80.4	S. E.	Cumulo strati.	.459	83.5	84.0	80.0	S. E.	Cumulo strati.	91.6	85.9	80.2	109.6	0.28	0.32	27	
.429 89.4	86.7	81.8	E. S. E.	Rainy.	.418	87.9	86.9	81.0	E. S. E.	Rainy.	.430	83.2	83.0	80.2	S. E.	Nimbi.	91.8	85.0	80.0	109.2	0.44	0.48	28	
.403 93.4	92.5	84.0	N. E.	Cumulo strati.	.385	91.0	88.4	82.9	S.	Cloudy.	.427	83.8	83.7	81.2	S. S. E.	Cloudy.	93.8	87.0	80.2	112.0	0.82	0.84	29	
.384 92.8	90.8	83.0	E.	Cloudy.	.368	88.3	85.2	82.2	S. E.	Nimbi.	.415	83.6	83.6	81.8	S. S. E.	Rain & Thun.	93.1	87.6	81.8	109.4	0.64	0.68	30	
																	92.2	86.6	80.9	107.1	11.52	12.24	31	

